A user centred approach to the modelling of contextualised experience adaptation in relation to video consumption.

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Abstract

This research focused on the development of a user centric framework for the interpretation of contextualised TV and video viewing experiences (UX). Methods to address content overload and provide better contextualisation when consuming video have been an area of academic discussion for almost 20 years (Burke, Felfernig, & Goker, 2011). However over the same period technical system design for video has actually moved away from attempts to model the nature of real viewing contexts. With now near ubiquitous access to video from a range of disparate devices the addition of contextualisation within video applications and devices represents an opportunity in terms of improving viewer UX.

Three user studies were carried out to inform development of the framework and employed mixed method approaches. The first focused on understanding where video is watched and the contextual factors that defined those places as viewing situations. This study derived eight Archetype viewing situations and associated contextual cues. The second study measured viewing UX in context. Significant differences in subjective ratings for measured UX were found when viewing was compared within subjects across Viewing Archetype situations. A third study characterised viewing UX, identifying behavioural, environmental and technological factors which through observed frequency and duration were identified as indicative enablers and detractors in the creation of viewing UX.

Concepts generated within the studies that related to viewing context identification and viewing UX classification through experiential factors were integrated into the framework. The framework provides a way through which to identify, describe and improve viewing UX across contexts. Additionally the framework was referenced to develop an exemplar system model for contextual adaptation in order to show its relevance to the generation of technical system design. Finally information for designers was created in the form of scenarios and suggestions for use in order to bring the framework to life as a resource for development teams.

Contents

1 Introduction

1.1 The video consumption landscape

There have been huge changes over recent years within the arena of video content consumption. The traditional television viewing experience has been radically transformed in the digital age. Viewers now have access to huge choice in content, on-demand availability and complementary interactive services. These advances have been paralleled by developments in both mobile connectivity and device hardware that release video consumption experiences from the constraints of the living room out into every area of our mobile lives.

1.1.1 Choice and the problem of content overload

Since the mid 2000s broadcasters and content providers have strategically driven video service developments towards supporting long tail business models (Anderson, 2006). The goal is to make access to an ever-greater choice in on-demand video content a technical reality. The commercial rationale behind the long tail model is explained by the area under the curve in the long tail of the power law graph (see Figure 1.1). The premise of the model is that significant revenues are to be made through the offer of a product choice large enough to cover the widest possible set of customer preferences, however niche. Through such an offering, the accumulated sales within each niche can sum to significantly higher volumes of sales than those achieved through traditional inventory management strategies. Traditional inventory management would advocate only a small range of popular items being stocked and sold in high volumes.

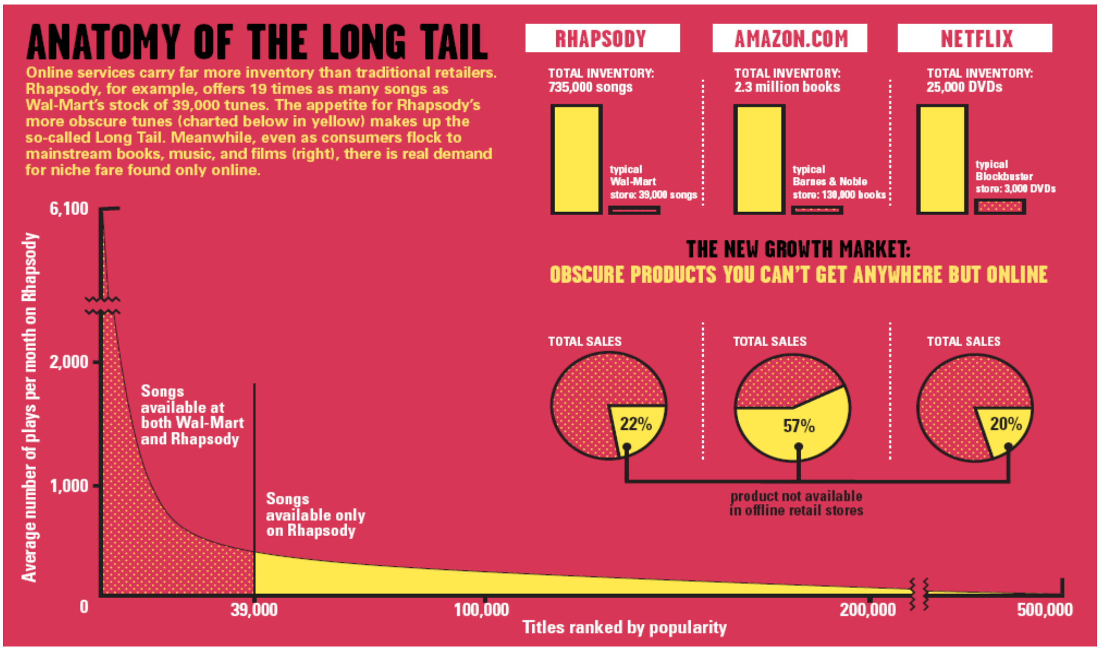


Figure 1.1. The long tail business model states that inventory sales of niche items (shown in the yellow area under the curve) when taken as a whole can contribute significantly to overall sales volumes (Anderson, 2004).

The long tail model is particularly suited to the delivery of digital content due to the low expenditure of storing and delivering data when compared to the costs of warehousing and shipping physical products. This allows digital content to be offered as an attractive low cost purchase to consumers.

There are examples of the growing importance of increased content choice around us everywhere in the Video on Demand (VoD) digital marketplace. The Apple iTunes store offers 300,000 television episodes and over 85,000 feature films (Apple, 2015). Virgin media offers catch-up TV where users can watch up to 13 previous episodes of hundreds of TV series (Virginmedia, 2014). British Sky Broadcasting offers the largest "catch-up" VoD library in the UK through Subscription TV (BSKYB, 2014a), as well as providing an alternative non-subscription over the top (OTT) service in the form of Now TV. We can also add to the list of long tail content aggregators, a host of other disruptive OTT web based streaming services which rely on existing broadband provider infrastructure to deliver content rather than traditional broadcast technologies. These include Hulu.com, Tesco's Blinkbox and Netflix, which is the world's leading internet TV network with over one billion hours of TV shows and movies watched each month (Netflix, 2014).

The new landscape of video services offer commercial opportunities and consumer choice, however there is an issue that threatens the revolution. With so much programming and content available, a difficult user experience (UX) problem has evolved around content discovery in different consumption situations. How do users successfully locate interesting content suitable for their viewing context? Traditional mechanisms for the discovery, display and selection of video programming such as current electronic programme guide solutions have started to break down (Smyth & Cotter, 2001). This has been further exacerbated by attempts to bring richer media experiences and non-traditional interactive content to the TV (Obrist, Moser, Alliez, Holocher, & Tscheligi, 2009). Conversely the rise of internet search mechanisms which currently aggregate large amounts of content in the PC environment are not well suited to passive lean back viewing experiences in the home living room (Taylor & Harper, 2003). Even a novel search solution such as LG's TV voice search can only find content you are aware of, and not new shows for you to discover (LG, 2013). This issue has the potential to negatively impact upon the UX of video content discovery and consumption, which in turn threatens the continued growth in user patronage of existing services.

1.1.2 Personalised experiences and context of use.

In an attempt to solve the issue of discovering suitable content, a whole field of research has evolved over the last twenty years focused on developing personalised recommender technologies. Burke et al. (2011) offer a thorough summary of the state of the art. Recommender systems achieve personalisation by maintaining a profile of user activity or past preferences (Schafer, Frankowski, Herlocker, & Sen, 2007) and use this information to aggregate from the huge amounts of content available, only those items likely to match the user's interest. This vastly reduces search effort and promotes items that may otherwise have never been discovered. Due to the diversity of viewing preference and huge amounts of content available a strong case for the personalisation and adaptation of video consumption experiences has therefore emerged, and user requirement studies have shown users generally welcome such technologies (Bernhaupt, Obrist, Weiss, Beck, & Tscheligi, 2008).

As content recommender technologies have matured, they have seen greater use in commercial applications including the TiVo set top box (McCabe, 2010; Ali & Van Stam, 2004), YouTube (Davidson, Liebald, Liu, Nandy, & Van Vleet, 2010) and Netflix (Vanderbilt, 2013), however they have not become a ubiquitous feature of video services. Critically discovery of content offers only one piece of a larger adaption solution needed to improve video experiences. The true utility of a system that can learn and adapt to a user's preferences goes beyond the content it can retrieve and actually sits in the viewing experiences it can create in specific viewing contexts. This moves video service adaption considerations beyond content selection to address other areas of experience such as user interface presentation and video delivery methods. Adaption of such areas requires an awareness of the context of use. Traditional television consumption experiences in the living room take place in differing contexts. Watching alone or with others, with whom we watch (Masthoff, 2004) and what time of day it is, are just some of the aspects that could impact content choices and the on going viewing experiences we create. Therefore a fundamental component needed within considerations for a better solution to personalised video UX is a framework for understanding viewing context.

1.1.3 Ubiquitous access to video.

Considering the different contexts in which video is enjoyed is further complicated by the advent of increasingly ubiquitous access. The arrival of new video encoding standards such as H.264 (ITU, 2014) together with high-speed mobile broadband and more capable mobile devices, has allowed access to video from almost anywhere. Technology advancements have therefore significantly multiplied the contexts in which video content is commonly consumed and therefore the range of viewing experiences that can be achieved.

However improvements in content access are not translating into increased user satisfaction (Nielsen, 2009). With so much variation within the contexts in which we consume video, how can companies confidently develop content, services and devices that will provide consistent, enjoyable viewing experiences across contexts?

Therefore in addition to knowledge of the preferences of the user, any future video application or system will also need an appreciation of the possible influences of the current context upon the user's viewing experience. Contextual aware systems, (Schilit, Adams, & Want, 1994) have sought outwardly observable information from the environment to infer features of the situation and thus make predictions in relation to the user's internal needs and wishes. This information is then used to adapt systems accordingly.

The combination of both knowledge from the user (in accordance with the user data elicited through personalisation), and contextual considerations related to adapting to the current viewing situation, appears to provide the most optimistic possibility for successfully tailoring video viewing experiences to the user's satisfaction.

1.1.4 Transferring user knowledge across contexts and devices.

The strategy of combining collected user preferences and context appears a sensible approach to contextualising viewing experiences. This however is not a new concept as more recent systems currently exist that employ such strategies within the general field of contextually aware recommender systems (CARS) (Costa & Goncalves Filho, 2007). However although these systems consider contextual elements, a possible weakness of the approach is a rigorous user focused method to contextual framework design. The resulting models are focused on generality of application and reuse (Mettouris & Papadopoulos, 2013) rather than user needs and understanding aspects of context as real users do. If a system collects data to build preferences on the types of video experience a user likes to create when alone at home on a Sunday afternoon, is it valid to say this knowledge of the user's preference can be usefully transferred to make predictions in other contexts? Would content choice and experience creation not differ if watching with their children? Would it not differ if watching content on a mobile phone in public rather than through the family TV?

Inherently we can identify that whether consciously or sub-consciously, people continually and seamlessly adapt their underlying viewing preferences and expectations in response to differing contextual conditions.

Against a background of ubiquitous access to video content and the ability to create viewing experiences almost anywhere, the important questions to ask are what aspects of the user's situation are significant in shaping their preferences, and what UX should a system seek to deliver across those contexts to best satisfy them? Bettini et al. (2010, p. 17) highlights this issue as a considerable existing problem within the field of contextually aware systems development:

> *"Though approaches based on formal logics provide a high-level of abstraction and formality for specifying the situations, they are error-prone in the domain of context-aware computing due to the incompleteness and ambiguity of contextual cues."*

1.2 Problem statement

Ubiquitous access to video content through long tail business models is providing wide reaching benefits to end-users. However issues related to content discovery and consumption has the potential to negatively impact user experiences and inhibit the continued uptake of new services in the video consumption domain.

Content recommender systems that utilise knowledge of the user in combination with elements of contextual awareness may offer benefits, however discovery of content is only one piece of the puzzle. In addition, current solutions focus on the development of the underlying technology frameworks rather than considering the actual consumption experiences that influence a user's overall satisfaction with the viewing UX.

With the proliferation of video capable mobile devices and ubiquitous access to content there is an ever-greater need to understand the contextual issues surrounding the discovery and consumption of video content from a user centred perspective. Increased understanding in this area can inform the development of future models for personalisation and adaption that must operate with a more intelligent and user centred appreciation of viewing context. This can be achieved by characterising an alternative framework for video consumption context based on user insight rather than technical design. Through such an approach, the contextual influences upon viewing experience can be understood and integrated into a framework model. Future systems can then utilise knowledge from that framework to take contextually relevant actions in terms of adapting content selection, UI presentation or video delivery method to provide the best possible UX.

1.3 Project aims, research questions and objectives

The goal of this research was to provide a user centric framework for the interpretation of viewing context. The main aims of the project can be summarised as:

A. To investigate the relationship between viewing context and viewing user experience from a user centric perspective.

B. To characterise the influence of contextual factors upon the quality of viewing user experience.

C. To develop user centred insights and create a design reference or source of information for viewing context. Designers could utilise the information to inform the design of future services seeking to develop awareness of the viewing context.

D. Through the development of design references integrate UX knowledge of the adaption strategies that can improve user experiences within specific viewing contexts into design thinking.

This project was focused on informing both designers and developers involved in creating future video services. The aim of developing design references in the form of a conceptual framework was to create a resource that development teams could use to inform the design of their initial technical architectures and feature designs. By taking a user centred approach to the framework creation developers using it could be confident the insights it provides are informed by real users and targets improved viewing UX. As will be discussed in the literature review, this represents an enhancement in technical design approaches to context awareness and adaption in terms of considering user insight right from the very start of system development. The research questions posed therefore addressed three areas; viewing context, video consumption experiences and the framework development.

1.3.1 Characterising viewing context.

Aspects of context appear to be fundamental influences upon the formation of video content selections and underlying viewing UX. Yet the components of context at play within these processes are not well understood or described. This is a complex area to consider as a multitude of factors such as our own internal goals, psychological state, location, access to technology and social situation all have the possibility to highly influence the viewing context.

The first two research questions address the need to define within the framework structure both the viewing situations and the components of context that characterise them.

1. ***In which situations do people watch video?***

2. ***Which elements define those situations as different viewing contexts from the perspective of users?***

The objectives in answering these questions were to:

- Identify specific viewing situations to consider within the framework design.

- Identify the contextual cues that differentiate those viewing situations to allow the framework to recognise viewing which occurs in specific contexts based on the contextual factors present.

1.3.2 Understanding video consumption user experiences.

The impact of context upon viewing experience cannot be fully answered without a better understanding of viewing UX itself. This question attempts to understand the mechanics of viewing experience in order to identify and characterise the underlying factors indicative to the creation of the user's consumption experience within specific viewing contexts.

3. ***Which behavioural, environmental and technological factors influence viewing user experience quality within specific viewing contexts?***

The objectives in answering this question were to:

- Measure differences in the quality of viewing experience in different viewing contexts.

- Identify the enabling and detracting experiential factors present in specific viewing contexts that affect the quality of viewing experience.

Incorporating this level of knowledge into the framework offers opportunities to designers in terms of informing system designs that can adapt sympathetically within given viewing contexts to improve viewing experience.

1.3.3 Generation of a framework.

This question addressed the need to integrate knowledge of viewing contexts and viewing user experiences into a coherent conceptual model to serve as a design reference. Such a framework can inform future system architecture models aimed at improving video consumption experiences across viewing situations through adaptation.

4. ***Which framework structure would allow future systems to improve viewing experiences by providing a better user centred approach of viewing context adaption?***

The objectives in answering this question were to:

- Develop a contextual framework for context that integrated the knowledge of viewing context and viewing experiences elicited throughout the project.

- Use the framework as a reference to create example scenarios to serve as guides for designers and developers considering viewing experience within new video services.

Addressing these objectives would provide a logical framework structure that linked low level components of context to the identification of viewing situations and the optimised support of the viewing user experiences created within them.

1.4 Guide to the thesis

The activities of the project consisted of several phases of research and design, and are structured to address the main aims of the project and answer the research questions posed.

Figure 1.2 provides an overview of the activities undertaken and how each relates to the project aims, objectives and research questions. The second column of the diagram provides a guide to the structure of this thesis in terms of where aspects of the project are discussed within the document.

Activity	*Thesis section*	*Research questions and objectives*	*Aims*
Review of literature related to context and contextual awareness, user experience and it's relationship to video consumption.	Chapter 2. Literature Review.		
Literature review of ethnographic research describing Archetype viewing situations. ***User Study 1.*** *Verifying the contexts and contextual cues discovered in literature through study of real viewing situations.*	Chapter 4. Study 1. Understanding Contextual Cues.	1. In which situation do people watch video? 2. Which elements define situations as different? - Identify viewing situations to consider in the Framework. - Identify the contextual cues a system can use to differentiate specific viewing situations.	A. Investigate the relationship between viewing UX and viewing context.
User Study 2.1. *Measuring viewing user experiences in specific viewing contexts.*	Chapter 5. Study 2 Part 1. Measuring viewing UX in context.	3. Which factors influence viewing user experience within specific contexts? - Measure differences in the quality of viewing UX across contexts	B. Characterise the influence of contextual factors upon the viewing UX
User Study 2.2. *Identifying experiential factors influencing viewing UX ratings (as obtained in study 2) within specific viewing contexts.*	Chapter 6. Study 2 Part 2. Characterising Video Consumption.	- Identify enabling and detracting factors within viewing contexts that influence viewing UX.	
Development of a conceptual framework for viewing context informed by the output of the user studies.	Chapter 7. A Framework for contextualised video consumption	4. Which framework structure allows improved UX and a user centred design approach - Develop a conceptual framework that integrates viewing context and UX - Provide design references related to the Framework to inform future design.	C. Develop the user centred insights gathered into design references for viewing context. D. Through the design references provide information for designers on adaption strategies to optimise viewing UX.

Figure 1.2. A guide to the project in terms of activities, thesis structure, research questions addressed and main aims.

2 Literature Review.

2.1 Introduction

2.1.1 Timeline of the research.

The investigations carried out within this project represent a total of seven years of part time study effort. For a research activity aimed at improving a current field of technology, there was always a threat that the state of the art would move on over that time at a rate to render the research no longer relevant. However despite a technical revolution in hardware, device connectivity and access to content over that time, the issues that drive the need for better video consumption experiences that are both personalised to the user and contextualised to the viewing situation remain.

A study over such duration also raises implications for how existing literature is approached. This became an on going consideration throughout the project and new literature was regularly reviewed and reflected in the work as it became available. In cases where new literature had relevance to activities already undertaken as part of the study, these are highlighted in the body in the thesis where relevant and the implications discussed.

Depicted in Figure 2.1 is a timeline illustrating the major shifts in relevant consumer technology over the duration of the project and how they aligned to research activity. Whilst updates and revisions to the text have been conducted throughout, it is hoped that by contextualising the research studies within the technological landscape of the time the reader can better appreciate the approaches and justifications proposed.

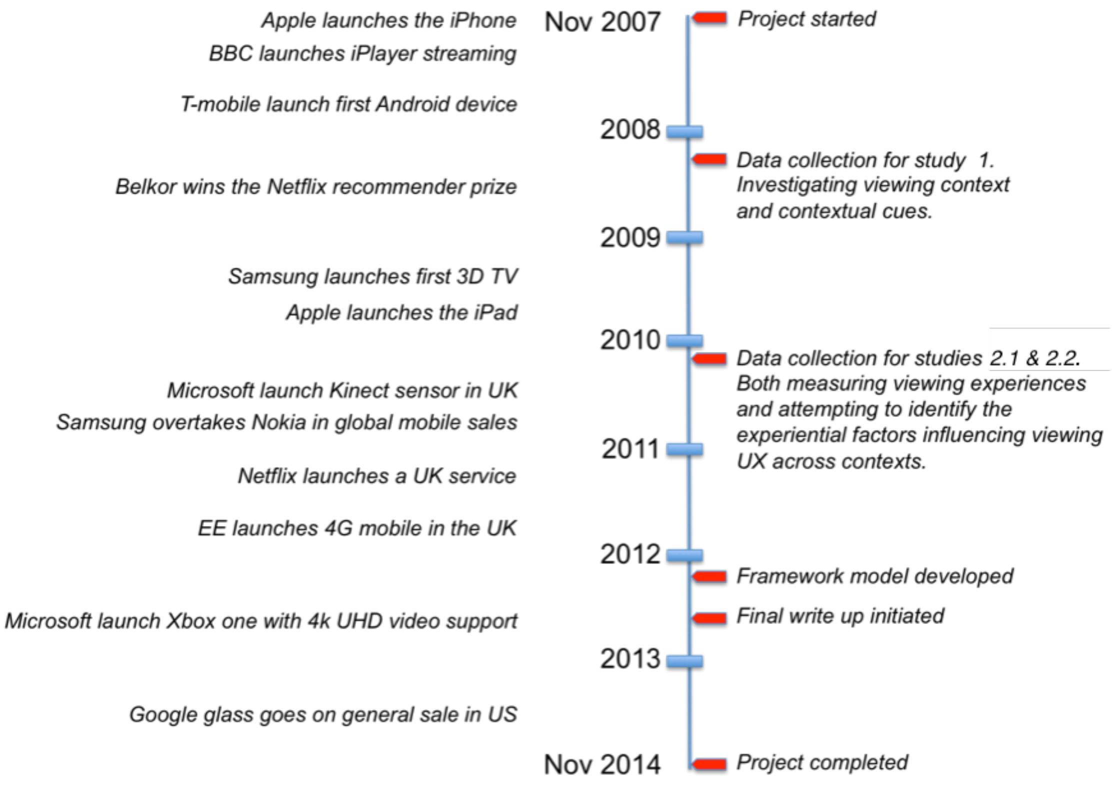


Figure 2.1. A timeline of notable consumer technology advances during the course of the research.

2.1.2 Areas of literature addressed.

The aims of the research relate to three fundamental investigative paths:

- To understand the relationship between viewing context and viewing experience.
- To understand the factors that effect viewing experience outcomes.
- To develop insights into viewing context and viewing experience into a conceptual framework through which to understand viewing context.

As such, the goal is then being to improve future video services by use of the framework. This focus touches a number of areas of the literature that need exploration.

The first area of concern is the nature of video consumption UX. What are the key components of experience, and how can they be quantified? What overlaps exist in relation to the models in the literature used to usefully characterise video consumption?

The second area of concern is the nature of viewing context. How does it relate to the consumption experience, and what is the best approach through which to define context within the research?

The final area is the question of what work has been conducted in relation to models for integrating context awareness into technical systems? How can that research inform the construction of a framework relevant to viewing context for system architects and experience designers?

2.2 The UX of Video consumption.

2.2.1 From usability engineering to UX design.

Human Computer Interaction (HCI) has traditionally focused upon improving the usability of products and systems. ISO 9241:11 (1998) defined usability as the effectiveness, efficiency and satisfaction with which specific users can achieve specific goals. Usability engineering therefore evolved from a focus upon the task, the efficiency with which the user can complete that task, and the removal of negative aspects of interaction that may hinder successful completion (Jordan, 2002). Early approaches in usability focused on task completion. This led to interaction being considered in narrow terms with regards to perceptual and cognitive processes (Hassenzahl, 2008). In turn this resulted in a simplification of system–user interactions in order to make tasks easier and more efficient. However this approach under values our relationship with technology, defining use of a system as a productivity tool rather than a pleasurable activity in it’s own right (Hassenzahl, 2008).

In reality the components involved in the creation of experiences with a product appear more complex. Rather than reductive in nature they are in fact additive, moving beyond supporting a given task output. Jordan (2002) lays out a simple hierarchy of consumer need ranging from the base need for functionality, through usability to pleasure. This move from the instrumental to the experiential can be seen as analogous to climbing Maslow’s (1970) hierarchy of needs (Figure 2.2).

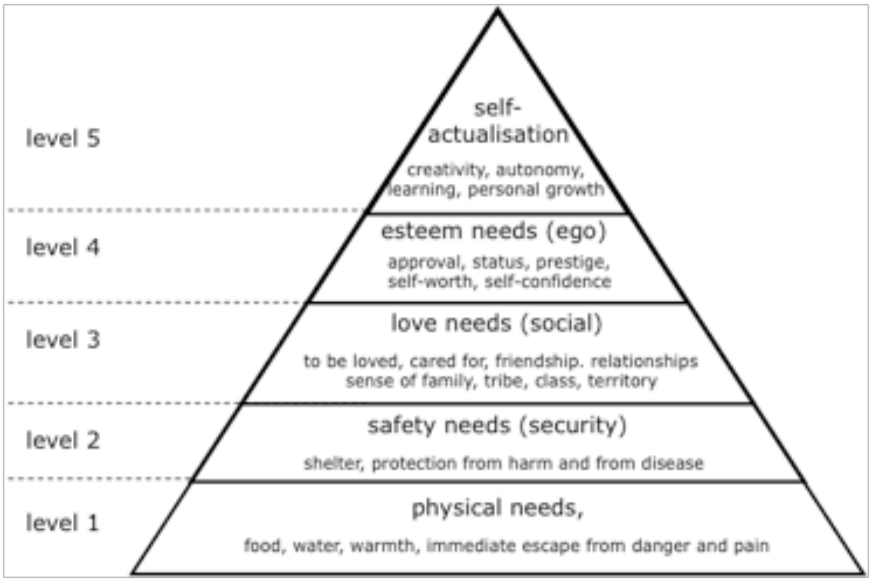


Figure 2.2. Maslow's hierarchy of needs, ranging from instrumental physical needs to higher social and psychological needs (Maslow, 1970).

Experiences with products fulfil human needs and as such become ends in themselves, rather than only the means by which to accomplish a task. Forlizzi and Battarbee (2004) list these needs as the physical, sensual, cognitive, emotional and aesthetic stimuli we experience during our interactions with a system. These in turn drive our deeper underlying impressions and relationships with technology.

We can therefore view user experience (UX) as something that moves beyond usability. It shifts focus from a concern for task completion to emotional and hedonic aspects, from negating negative, to promoting positive interactions (Strohmeier, Jumisko-Pyykkö, Weitzel, & Schneider, 2008).

UX is dynamic in nature, and ever changing due to the relationship to the internal emotional states of a person (Law, Roto, Hassenzahl, Vermeeren, & Kort, 2009). Designing a system in order to provide an overall compelling UX therefore requires an understanding of the aspects at play within an interaction and a robust method through which such seemingly ephemeral and subjective qualities can be quantified. Only through a shared model of understanding can a design team utilise such insights within the creation of the UX for a new system.

2.2.2 Selected frameworks for user experience.

Early examples from the literature to provide models for UX (Alben, 1996; Kerne, 1994; Forlizzi & Ford, 2000) describe the construction of complex frameworks, yet the components that contribute to experience remain ill defined. This highlights two significant issues with defining UX. Firstly; there is no agreed definition for UX amongst researchers in the field (Forlizzi & Battarbee, 2004; Law et al., 2009). Secondly, the holistic nature of experience complicates the process of defining UX as constituent components (Strohmeier et al., 2008). Therefore, whilst current approaches towards defining UX are of interest to designers they are difficult to apply to real world design processes. Despite these issues, attempts to consolidate research from across the domain have led to the identification of universal themes. Hassenzahl and Tractinsky (2006) identify three facets contributing to UX (Figure 2.3). Their model emphasises:

- Hedonic aspects of use that move beyond the instrumental function of a system.
- The importance of emotion and affect in the relationship between the user and a system.
- The importance of the experiential in UX, the dynamic temporal 'in the moment' experience of the interaction.

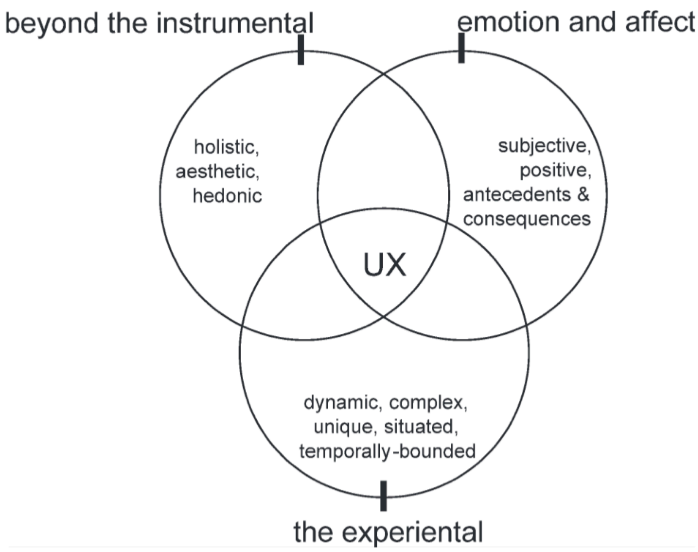


Figure 2.3. The facets of UX. Introduces the dynamic temporal experiential feeling of being 'in the moment' (Hassenzahl & Tractinsky, 2006).

Based on comparisons of the work of Jordan (2002) in the area of pleasure-based design, Norman (2004) in emotional design, and Schmitt (2006) in experiential marketing, Buccini and Padovani (2007) propose a UX typology consisting of six categories of experience created through people's interactions with products and systems (Figure 2.4). There are similar concepts within the typology when compared to Hassenzahl et al. (including the importance of an emotional connection with the product and pleasurable sensorial experiences over the instrumental). However Buccini and Padovani extend the range of paradigms contributing to UX. Significantly they introduce the concept of a motivational aspect to UX. Through a product's use, enjoyable behaviours are fostered over time. However the typology elements are framed as separate 'categories' of UX rather than contributory components to an overall experience.

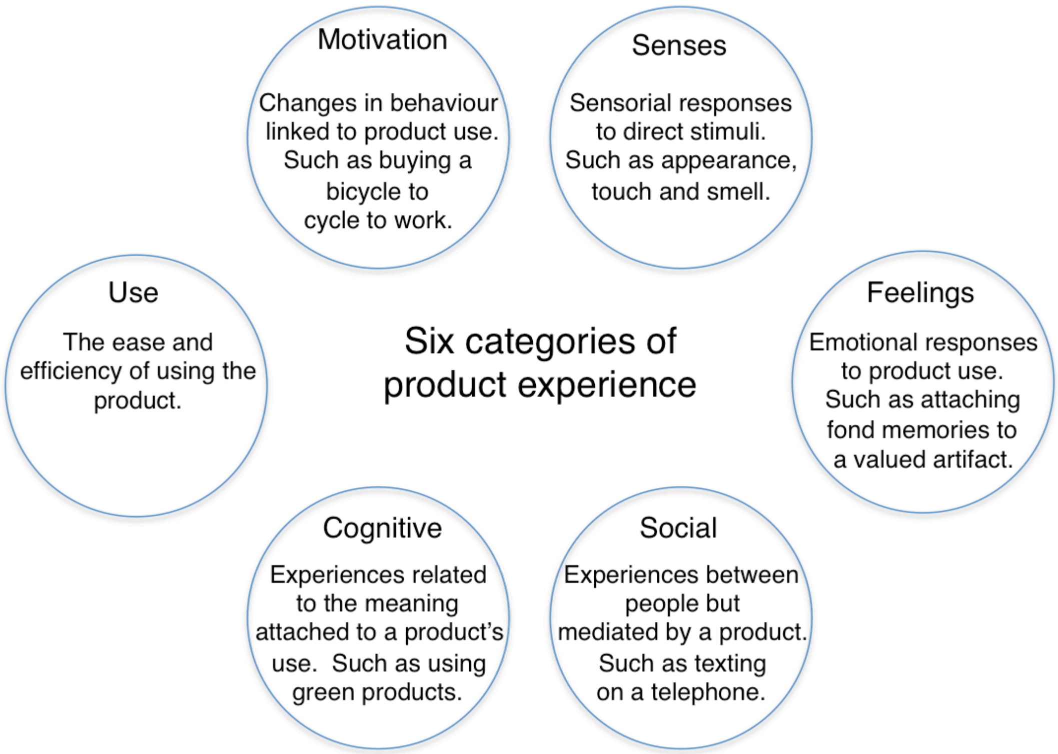


Figure 2.4. Typology of experiences during product use. (Buccini & Padovani, 2007).

Breaking the complex interplay involved in our relationships with technology into more definitive categorisations offers a useful method by which to define particular types of product experience. However the secret of creating a good

UX may be a matter of understanding the interplay between the dimensions within a product interaction, the person, artefact and environment (Law et al., 2009). However the fact that these aspects are rarely static adds complexity to any agreed descriptive framework. Wright, McCarthy and Meekison (2005) describe experience as a moving, fragile and fleeting event. As such rather than static categories as proposed by Buccini and Padovani (2007) experience is a continually evolving perception in response to changing temporal events, thoughts and feelings.

McCarthy and Wright (2004) cite the significance of spatio-temporal aspects as a core component of user experience. This forms one of their four threads of user experience:

- The Sensual – *The visceral character of experience felt in the moment and prior to any reflection.*
- The Emotional – *The emotional value judgement of how we summarise an overall experience.*
- The Compositional – *How the elements of an experience fit together into a coherent whole.*
- The Spatio-temporal – *The effects space and time have on the experience.*

Whilst the concept of the threads share much in common with Buccini and Padovani's categories a focus on the spatio-temporal is quite a different concept and provides more definition on the intrinsically temporal nature of UX compared to the 'experiential' facet of the model proposed by Hassenzahl and Tractinsky (2006). Wright et al. not only highlight the importance of context in the formation of experience, but also point to the subjective nature of the underlying aspects of experience. McCarthy and Wright (2004) also talk about the sense making processes that surround experience and include aspects such as interpretation, reflection and recounting. Hassenzahl (2008) supports this view of experience as subjective, defining UX as a momentary and primarily evaluative feeling.

Hassenzahl emphasises the relationship to feelings, fulfilment of needs and the subjective side of product use over time.

If experience is therefore in the mind then it is something that needs to be investigated from a subjective viewpoint. UX hinges on the perceptions of the user and therefore there is validity in approaching the problem from investigating aspects of the user's state.

A core theory from motivational psychology in this area is Flow (Csikzentmihalyi, 1975). Flow is described as the process of optimal experience (Csikszentmihalyi & Csikszentmihalyi, 1990). Nakamura and Csikszentmihalyi (2002) define the characteristics of experiencing Flow as:

- Intense and focused concentration on what one is doing in the present moment.
- Merging of action and awareness.
- Loss of reflective self-consciousness.
- A sense of being in control of one's actions and the situation at hand.
- A distortion of temporal experience (usually time passing more quickly).
- A sense of the current activity as being intrinsically interesting and rewarding, in which the ultimate end goal is often just an excuse for partaking in the process.

Researchers working in different areas have investigated the conceptual idea of Flow as a positive outcome of experiences with technology. These have included E-commerce (Donna & Novak, 1997) and more specifically online shopping (Smith & Sivakumar, 2004), online gaming (Hsu & Liu, 2004), interactive television (Stienstra, 2001), website design attributes Burke et al. (2011), and a number of other computer mediated environments, (see Finneran and Zhang (2005) for a review of other related studies).

Flow emphasises the significance of perceived control, user action and system re-action in the creation of experience. Combined, these aspects support the notion of interactivity as a core component within the creation of experience. Donna and Novak (1997) cite interactivity as a property of Flow, whilst Stienstra (2001) suggests interactive television enables Flow as it allows users to move out of the passive role of "couch potato" to actually affect the performance.

However interactivity as a core component of UX does not appear valid when applied to traditional video consumption. Until the comparatively recent advent of interactive television, video watching was a passive experience and still remains so in the majority of cases. Millions of people still regularly watch television at home as their major source of entertainment. This suggests enjoyable experiences can be achieved without continuous interactivity or apparently the creation of Flow.

Webster and Ho (1997) propose the concept of Engagement as a differentiator between positive active experiences; Flow, and positive passive experiences; Engagement. They argue that Engagement shares many of the aspects of the Flow UX such as focused attention, user curiosity and held interest, but lacks the direct user control required to engender Flow. They cite television consumption as a prime example. O'Brien and Toms (2008) also support the position that Engagement shares many of the features of Flow, including those investigated by Webster and Ho (1997). However O'Brien & Toms' proposal of the differences between Flow and Engagement go further, arguing whilst Flow requires sustained long termed focus and loss of awareness, the process of Engagement (through a sequence of engagement, disengagement and re-engagement) can still occur in the midst of today's multitasking and dynamic environments. This concept means Engagement can describe both interactive and passive experience.

The concepts from the literature covered in this section are recapped in Table 2.1. This provides an overview comparison of the attributes within each description of user experience.

Common Conceptual Factors of UX & Engagement	Engagement O'Brien & Toms (2010a)	Engagement Webster and Ho (1997)	Flow Nakamura and Csikszentmihalyi (2002)	Facets of UX Hassenzahl & Tractinsky (2006)	Experience Typologies Buccini and Padovani (2007)	Experience Threads McCarthy and Wright (2004)	Pleasure Jordan (2002)
Easy to use	Perceived Usability				Use		Usability
Attention	Focused Attention	Attention Focus	Focus Merging of action and awareness Temporal distortion				
Emotional Involvement	Felt Involvement			Emotion & Affect	Emotion	Emotional	Psycho-Pleasure
Interest	Novelty	Curiosity Intrinsic interest			Cognitive	Compositi-onal	Ideo-Pleasure
Reward	Endurability		Intrinsically rewarding	Beyond the instrumental	Motivational		
Physical Senses	Aesthetics				Sensorial	Sensual	Physio-Pleasure
					Socialness		Socio-Pleasure
			A sense of control				
				The experiential		Spatio-temporal	
							Function

Table 2.1. Comparison of attribute areas of selected experience frameworks as discussed in the literature. Common factors across frameworks are presented in the right-hand column.

2.2.3 UX and video consumption

Investigations of UX within the video consumption literature are extensive, but generally focused on evaluations of specific aspects of the experience, (discuss later in this section). There is however some general exploration of UX definitions that relate strongly to video consumption.

McCarthy, Wright, Wallace and Dearden (2006) document the concept of product enchantment. This notion captures the mix of excitement, surprise, pleasure, satisfaction and captivation we experience when our interactions with a product or system are truly compelling. The paper relates enchantment to cinema. Boorstin (1990) argues that it is possible to gain immense enjoyment from cinema on three distinct levels:

- The wonder of sensorial experience – Through the visceral sensorial stimulation offered by cinema screens and stereo sound.
- Intellectual engagement – Through consideration of the narrative of the story or director's conception of the piece.
- Emotional response – Through identification with characters in the story and our own relationships and memories associated to specific content.

See-To, Papagiannidis & Cho Our (2012) also define video viewing experiences on mobile devices as consisting of sensory, cognitive and emotional aspects. Such experiences are clearly deeply stimulating to the viewer across distinct and multiple experience categories which are highly aligned to more traditional frameworks for UX (see Table 2.1). Whilst this may suggest video consumption is a similar blend of utilitarian and hedonic aspects as in other forms of UX, Dhar & Wertenbroch (2000) argue that when engaging in leisure activities such as using entertainment technology, users value hedonic qualities over the utilitarian alternatives.

Stienstra (2001) argues that rather than being a passive viewer it is the interaction within interactive television (iTV) that offers viewers the opportunity to create Flow and this in turn is key to creating engaging broadcast experiences. Bernhaupt et al. (2008) argue that even traditional TV viewing is interactive, if understood as a psychological and emotional process, not as a technological one. But this is a confusion of terms, as interactivity in the context of the creation of Flow is characterized by control and not only action and reaction (see Table 2.1). Janse, Stienstra & De Ruyter (2001) expand the idea of interactivity as the key to augmenting viewing UX, advocating that compelling and enchanting iTV experiences need to comply with at least one of:

- Providing feedback in the User interface (UI)
- Providing users with control over the content
- Enabling users to participate in the program content
- Give users the feeling or opportunity to produce something useful
- Provide people with the possibility to communicate with others
- Make program changes depending on user behaviour

These themes cover a wide range of video related UX components, from user interface issues to consuming and interacting with the video, communication, social sharing and even content production. Defining the boundaries of where experiences with video actually start and end therefore introduces a further layer of complexity to characterising the UX of video consumption.

We can use this lens to look at the literature in this area, imagining the video consumption experience as a timeline mirroring the lifecycle of a piece of content once it has been created. Starting from a user acquiring the content, actually watching it and finally responding to the experience and possibly sharing it with others.

Acquisition

This is the pre-process through which a user gains access to a piece of content. This is a discovery process and relates to elements of a user's information seeking behaviour (Lee & Smeaton, 2002). This activity was also part of an investigation by Cunningham and Nichols (2008) in the field of internet-based video that identified key search and browsing strategies used in the selection and attainment of content. Similar acquisition processes exist in other video domains such as browsing a television electronic programme guide or searching the shelves at the DVD store for a specific movie. Taylor and Harper (2003) identified specific strategies for programme discovery and selection in the home environment that were linked to the current viewing context. This area has also attracted much concept design evaluation research. Konstantinos (2008) investigated novel interaction methods through which to navigate and control iTV. Cruickshank, Tsekleves, Whitham, Hill and Kondo (2007) investigated ways to overcome the usability issues of traditional electronic program guides by using a second screen to present the program guide. This area also includes content discovery technologies such as recommenders, including concepts to personalise program guides (Zhang, Zheng, & Yuan, 2005) and also methods through which to offer content suggestions in multi user environments (Bonnefoy, Bouzid, Lhuillier, & Mercer, 2007). The significance of the acquisition process as an intrinsic component of the video consumption UX should not be underestimated or seen merely as a means to an end. O'Hara, Mitchell and Vorbau (2007) reported that during their study into mobile video usage, scouring the internet for content to load onto their mobile media players was seen by some users as an enjoyable activity in itself, with many users spending significant amounts of time doing so.

Watch

This aspect includes (but it not limited to) the act of viewing, and represents the most significant element of viewing experience. Much research has been conducted into the factors that might foster perceptions of immersive presence (Lombard, Reich, Grabe, Bracken, & Ditton, 2000). These have related to presentation of the video itself, including aspects related to image size and quality (Lombard, Ditton, Grabe, & Reich, 1997; Knoche & Sasse, 2009; Ghinea & Patterson, 2011), and fidelity of related audio (Reeves, Detenber, & Steuer, 1993). Other studies have considered aspects of the content such as believability (Ditton, 1997), realism (Bracken & Atkin, 2004) and elements related to the user, such as their willingness to suspend disbelief (Lombard & Ditton, 1997). However perceptions of such elements do not necessarily equate to user acceptability or positive experience. Many experiences of video viewing (e.g. some documentary, news and magazine shows) do not engage users in immersive experiences but can still be enjoyable and worthwhile. This is further complicated by the fact that few studies in this area attempt to link the concepts they investigate to positive user experience outcomes.

Other literature related to video viewing falls into three categories (Table 2.2). Firstly is a range of qualitative studies that address the characterisation of viewing scenarios and emergent viewing behaviours. Secondly are studies that document user needs and derive requirements for future video services. Both approaches are closely interrelated and provide a diverse range of insights around viewing practices and user behaviours. However due to the lack of a quantitative component these studies do not address measurement of the quality of the experiences they describe. A third class of study does quantify the elements they describe, though the focus of these studies relates to specific aspects of video device performance. This includes studies of formal video quality evaluation (Jumisko-Pyykkö & Häkkinen, 2005) and user perceptions of network performance on video quality delivery (Ghinea & Thomas, 2005).

Areas of literature related to watching video
1. Characterising viewing scenarios and emergent user behaviours
(O'Hara, Mitchell, & Vorbau, 2007) (Bernhaupt, Obrist, Weiss, Beck, & Tscheligi, 2008) (Saxbe, Graesch, & Alvik, 2011) (Taylor & Harper, 2003)
2. User requirements for future video services
(Knoche & McCarthy, 2005) (Strohmeier, Jumisko-Pyykkö, Weitzel, & Schneider, 2008) (Obrist, Bernhaupt, & Tscheligi, 2008) (Bernhaupt, Weiss, Wilfinger, & Tscheligi, 2009)
3. Measurement of specific aspects of video quality perception
(Jumisko-Pyykkö & Häkkinen, 2005) *Video picture quality.* (Ghinea & Thomas, 2005) *Network performance effects on video.* (Ghinea & Patterson, 2011) *Frame rates across devices.*

Table 2.2. Three main literature areas addressing video viewing.

Whilst all these studies provide useful insights they address only individual aspects of the overall UX. Additionally due to the psycho-perceptual focus of the quantitative investigations in category three, it is difficult to relate findings to contextualised video UX due to the lab based nature of studies rather than if they had been grounded in real world viewing situations.

Beyond the act of viewing, the watch component of the experience also includes all the interactions we may have during viewing. Such interactions can change the way we experience video. This includes our interactions with the mediating device, making relevant literature such as Konstantinos and Spinellis (2006) who advocate the importance of pleasure and arousal, involvement, programme liking, engagement and hedonic qualities in the creation of iTV experiences. It also includes interactions not mediated by the device. Viewing fits around the everyday routines of people (Taylor & Harper, 2003), and Bernhaupt et al. (2008) described users carrying out all sorts of unrelated activities whilst relaxing in front of the TV such as socialising with others, answering the telephone and writing down notes.

Respond and share

Responding and sharing are the processes through which content is shared in some way with others. This could be through very elemental ways such as watching a movie and then sharing opinions about it with work colleagues the next day. Other examples of a similar process is leaving comments below content clips on video sharing sites (Cesar et al., 2008) and even the direct sharing of the video content itself (Reponen, Huuskonen, & Mihalic, 2008).

A significant development in this area is Coppens, Trappeneirs and Gordon's (2003) concept of social TV, and particularly the act of social communication during video consumption itself. Despite much research in the lab, this user behaviour only recently came of age through the advent of real time social media feeds such as twitter[1] that were then further evolved by TV specific social media applications such as Beamly[2]. Social TV has prompted research in many areas including content genre appropriateness for social sharing (Geerts, Cesar, & Bulterman, 2008), synchronicity requirements when two or more people are watching remotely and commenting in real time (Geerts, Vaishnavi, Mekuria, Van Deventer, & Cesar, 2011), and the use of secondary displays for social augmentation of the viewing UX including the concept of secondary ambient displays (Harboe et al., 2008). Many of the UX issues raised in this area are addressed by Geerts and De Grooff (2009) who developed 12 sociability heuristics to best support social TV (Table 2.3). They advocate, amongst other issues, best practice principles to address the issues of synchronous and asynchronous use, personal and group privacy, minimising distraction from the main viewing content during social interactions, and fostering interaction through adapting social features to appropriate genres.

[1] www.twitter.com

[2] www.beamly.com

Sociability heuristics to support social TV
1. Offer different channels and levels for communicating freely
Enable freedom in choice of communication type, (voice chat, text etc.) and level of communication, (emoticons, auto replies, free-form communication).
2. Use awareness tools for communicating availability
Provide tools to indicate presence and inform of the current behaviour of others.
3. Allow both synchronous and asynchronous use
Provide functionalities for both synchronous and asynchronous communication so users don't always have to be present at the same time to communicate.
4. Allow remote as well as co-located interaction
Ensure features can be used simultaneously by remote users and those co-located.
5. Exploit viewing behaviour for informing and engaging other viewers
Use information about the users viewing behaviour to create functionalities for social interaction and recommendations for others.
6. Give the user appropriate control over actions and system settings
Give users control over settings to adapt the system to their needs or the situation.
7. Guarantee both personal privacy and group privacy
Ensure the system enables both personal privacy and group privacy, such as by taking into account the presence of multiple co-located viewers.
8. Minimize distraction from the television program
Design features so that they do not overly distract from the act of watching.
9. Notify the user of incoming events and situation changes
Notify the user of new incoming communications or changes in the situation, such as moving from watching alone to watching in a group.
10. Adapt to appropriate television program genres
Take into the account the genre of the content and the uses of specific content genres in specific social situations, such as the group viewing of sporting events.
11. Let users share content flexibly
Make sure users can easily send content to and from different devices.
12. Encourage shared activities
Allow users to easily start and maintain shared activities around viewing, such as communicating, watching together, choosing programs and controlling content.

Table 2.3. 12 Sociability heuristics to support social TV (Geerts & De Grooff, 2009).

Away from social TV other complex social aspects of the video consumption UX exist. One such area includes the desire of some users to curate content for others. This need to share and receive content appears to have recently emerged as an important form of social interaction. Taylor and Harper (2002) claim gift-giving rituals studied in relation to mobile content sharing by teenagers establish and cement social allegiances. Stelmaszewska, Fields and Blandford (2008) observed the sharing of photos from camera phones within social groups being used as a strategy for augmenting social interactions, both in the moment and after the event had taken place.

We can consider these three phases of acquire, watch and share in the same way that Forlizzi and Battarbee (2004) describe the scalability of experience. They argue that micro interactions with systems contribute to larger macro experiences, which over time become more memorable and stable. Through this approach we can view each phase as a component of the consumption paradigm, separately contributing to the overall video consumption UX (See Figure 2.5 for a visualisation of the macro experience). As Brown and Barhuus (2006) comment, when the consumption experience is considered as a whole lifecycle in this way, a host of important social aspects related to content discovery, ownership and sharing come into play, beyond the act of watching.

This approach to thinking about video consumption UX is useful as it opens up opportunities for design innovation. However it also creates a difficulty for UX designers in defining the boundaries of an experience. Substantial components of the user experience are created in the minds of the user through interactions away from the actual consumption of video, rather than on the screens of devices.

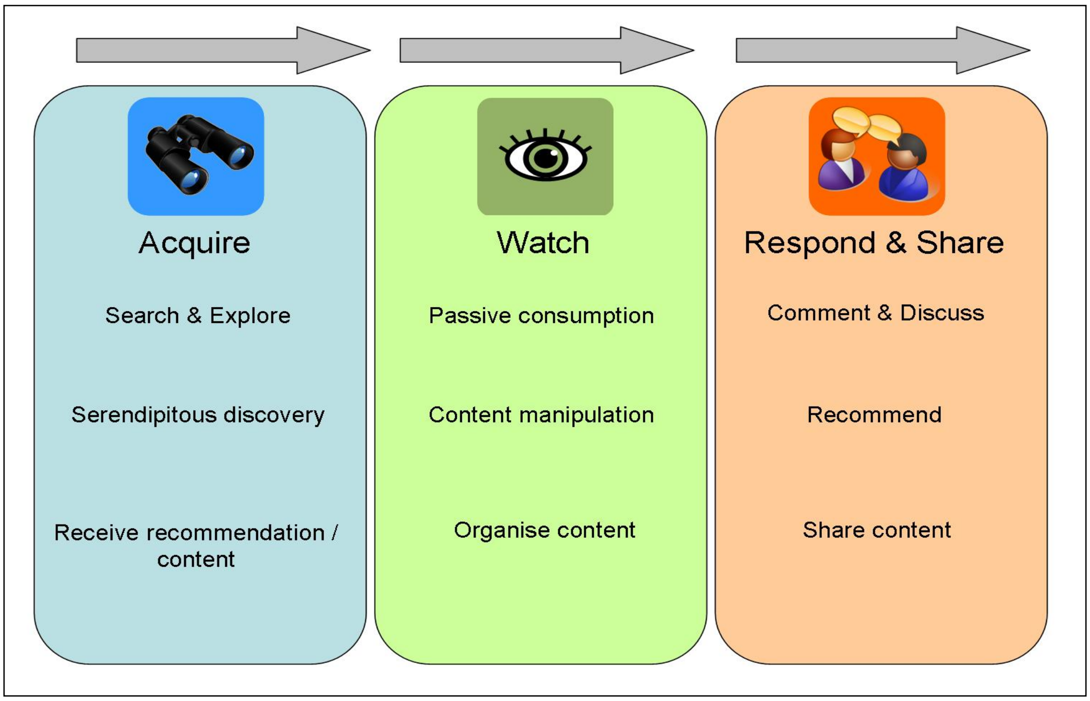


Figure 2.5. A visualisation of the macro viewing experience

2.2.4 A definition for video consumption UX.

For the purposes of clarity within the research activities undertaken, it was useful to take an initial methodological position in terms of a definition for video consumption UX.

The position aims to provide a framing boundary for a definition of video consumption UX in order to allow analysis and measurement. Based on the literature discussions above, three distinct aspects to the video consumption experience have been proposed; acquire, watch and share. However due to the myriad of opportunities for discovery and sharing, as well as the fact that the individual processes of discovering, consuming and socialising content can be separated by significant amounts of time and space, this process is rarely a single experience on a continuum. A user could see a trailer in a cinema for a movie months before they actually watch it at home on TV. In such a case the component experienced in the cinema, and the watch component played out in the home are not really part of the same experience. Additionally such a wide scope provides little utility to UX designers, as aspects of the experience can happen remotely from influences of the product design, both in space and time. It therefore appears important to confine the boundaries of experience to the activities designers can influence through device or system design. This position does not negate the designer from considering the wider experience. As all elements of the macro experience could in theory happen in a single consumption session it is valid in such cases to consider those factors. However no matter the area of interest, the framing boundary for the experience remains the interactions the user has with, (or in front of) the system, and therefore those aspects a designer can design for. This utilitarian position for the boundary of UX as product use agrees with definitions in the literature. Battarbee (2003, p. 109) argues;

> *"Whilst experience is essentially created by the users, it would not be possible without the presence of the product and the possibilities for experience that it provides."*

A second position is to address what video consumption experience actually is. As discussed earlier in this section, Boorstin's (1990) definition of movie consumption experiences as sensorial, emotional and intellectual aligns greatly with more traditional models for UX. In contrast, much of the work in the field of video user experiences has been conducted in relation to perceptions of image quality and immersive presence (Lombard & Ditton, 1997). If we however take the position that video consumption experience consists of much more than the visceral act of watching (as argued above), then instinctively definitions of video consumption UX based on reactions to video imagery alone are too narrow.

When once again considering the key frameworks for UX documented in Table 2.1 core consistencies arise when comparing the different models. O'Brien and Toms' (2008) framework for their concept of Engagement, Disengagement and Re-engagement (see Figure 2.6), offers a prospectively rich approach to defining and measuring video consumption UXs. The six factors they cite in their evolved definition of Engagement (O'Brien & Toms, 2010a) share many of the features of more classical UX frameworks documented in the literature, such as usability, involvement and novelty. These are important components if we consider the video consumption UX as additionally including more traditional interaction behaviours such as searching for content, navigating programme guides and using social media tools, rather than only the act of watching. Additionally O'Brien and Toms' framework covers components that are important to understand in the context of video viewing such as focused attention and aesthetics. A final consideration is whilst interaction forms a part of any experience, much video consumption behaviour still remains a passive action with the device a tool for content delivery rather than for interaction. Critically, being based on Webster and Ho's (1997) definition of Engagement O'Brien and Tom's framework can cope with the lack of consistent interaction and user control which we see in traditional viewing consumption, as well as the varying levels of engagement in different of types of video viewing (Vorderer, 1992). This is due to both their concept of Periods of Engagement and a hypothesized position based on Said (2004) and Chapman (1997) that Engagement intensity may change over the course of the experience dependant upon the user's needs, goals, emotions and thoughts, or format, visual presentation or organisation of the interface (O'Brien & Toms, 2010a). Therefore the concept of Engagement affords both traditional interactions and more passive consumption experiences. This is in contrast to most other concepts of UX based solely on the premise of interaction as intrinsic to the creation of experience (such as within the concept of Flow).

Despite these strengths, Engagement as a construct still suffers from some gaps in terms of appropriateness. Engagement exhibits the same definition and measurement issues encountered in discussions around UX. Namely that though it is an often-cited goal of design there is no clear or widely accepted method for how to actually make things engaging (O'Brien & Toms, 2008). Finding a way to operationalize UX through the concept of Engagement is key to evaluating design ideas for its positive presence and this will be addressed later in the work.

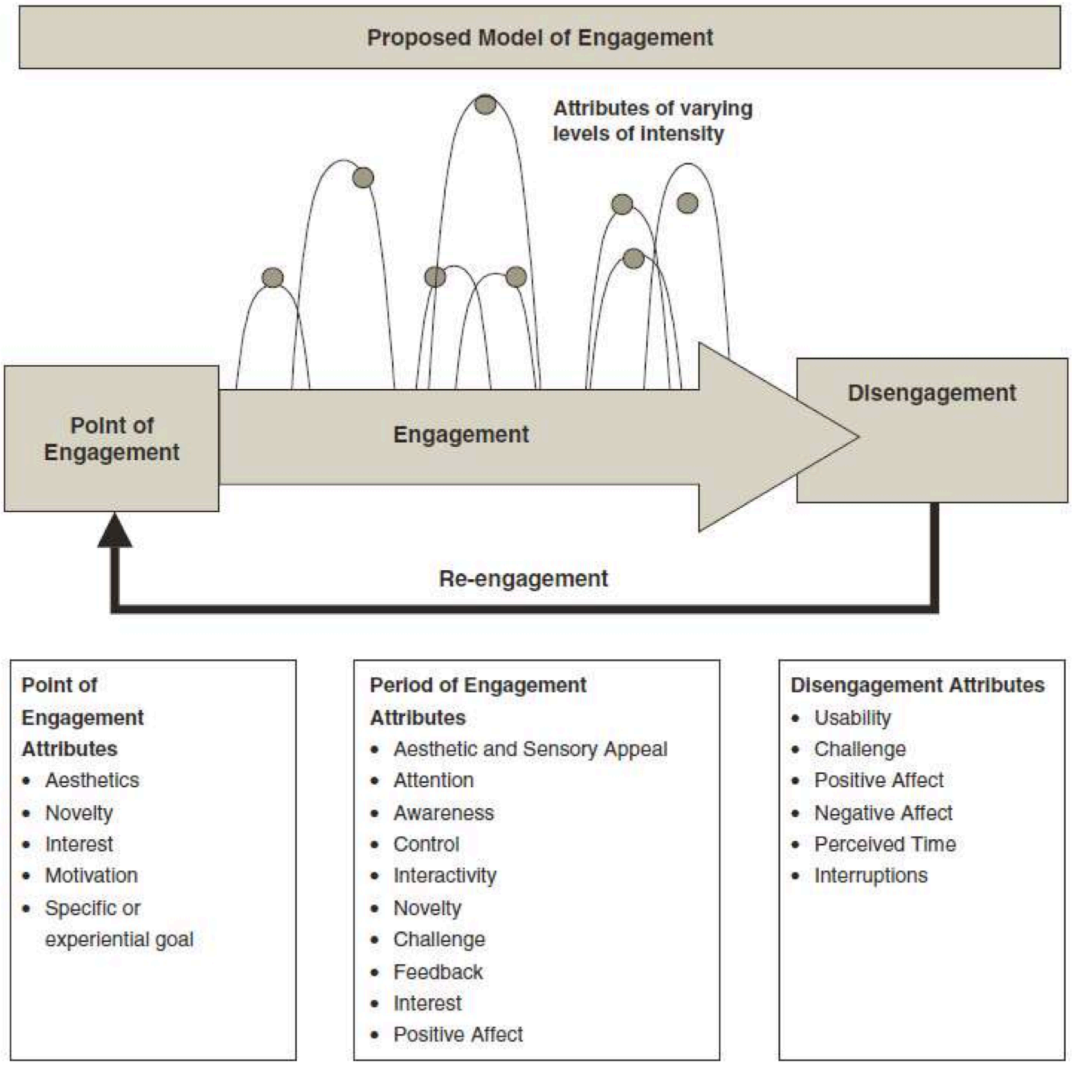


Figure 2.6. A proposed model for Engagement (O'Brien & Toms, 2008).

Drawing on O'Brien & Toms (2008; 2010a), Roto (2006), Brown & Barhuus (2006) and (Webster & Ho, 1997) some operational definitions can be presented for both video consumption user experience and Engagement:

Video consumption UX is composed of the acts of acquiring, watching and sharing video, facilitated through mediation with a technical system or device. It exists as internal perception and emotional judgements in the minds of the user but is manifest through the construct of Engagement.

Engagement is a facet of UX as defined by O'Brien and Toms (2010a)*. It is characterised by periods of engagement, disengagement and reengagement. Therefore intensity varies over the course of an experience due to both* *subjective internal factors and external influences. Engagement can be created through both active interaction and passive consumption, the later of which may lack both interaction and user control.*

Characterising the video consumption UX in this way is useful. It assists in confining the experience to a definitive set of interactions from within which the quality of video consumption UX can be investigated and measured. Additionally it sets up a conceptual framework for video consumption UX from within which aspects of device design and viewing situation can be investigated in relation of individual components of Engagement.

A significant component missing from the author's above definitions of UX and Engagement is context. This is in contrast to many of the positions taken on UX noted earlier in this section from the literature (Buccini & Padovani, 2007; McCarthy & Wright, 2004; Hassenzahl & Tractinsky, 2006; Alben, 1996). However the influence of the viewing situation upon the creation of experiences cannot be underestimated and in fact maybe inseparable from other contributing components. These concepts are explored in the following section.

2.3 What is viewing context?

2.3.1 The foundations of ubiquitous computing.

Access to and consumption of video content is becoming pervasive. Weiser's (1991) vision of ubiquitous computing is progressing rapidly towards an everyday reality. Continuous connectivity and access to device agnostic data services are allowing people to carry out activities and tasks almost anywhere that were once confined to specific locales by the constraints of technology. Weiser's vision was for a world where machines fitted into the human environment instead of humans being forced to enter theirs. However this requires technology to do much more than simply offer access to services unconstrained from traditional spaces. They must melt into the rich fabric of human social society and our physical realities. Abowd, Mynatt and Rodden

(2002, p. 48) argue that three criteria must be met before Weiser's vision can be successfully realised:

"Firstly, the everyday practices of people must be understood and supported. Second, the world must be augmented through the provisioning of heterogeneous devices offering different forms of interactive experience. Finally, the networked devices must be orchestrated to provide for a holistic user experience."

Such a fundamental shift in the abilities of technology systems require them to have a far greater appreciation of the physical world and the actions and motivations of the people who live within it. Perception of the world could be exploited by systems that adapt and behave in ways considerate to the user and situation through the interpretation of contextual information. Dey and Abowd (1999, p. 3) define context as:

"Any information that can be used to charactize the situation of an entity. An entity is a person, place or object that is considered relevant to the interaction between a user and an application, including the use and applications themselves".

Through this process the computer is transformed into an intelligent agent. Interest in this domain has fuelled activity in a wide breath of both technical and social research disciplines. Technology imbued with such intelligence has become known as contextually aware (Schilit & Theimer, 1994).

2.3.2 Context and the physical world

Many approaches to the definition of context are driven from the position that knowledge of the physical world can be employed to support a user task. From this general approach Chen and Kotz (2001, p. 3) provide a definition of context as;

"….*a set of environmental states and settings that either determine an application's behaviour or in which an application event occurs and is interesting to the user"*

Conceptually this approach deals in fact based models and emphasises the relationship to the physical reality. Frank (2001) provides a useful framework in this area, proposing 5 tiers of ontology for spatial context, running from the physical reality, through observations and abstracts of physical information to rules that are used by cognitive agents to interpret situation. Systems built on such ontologies look to employ sensor and inference technologies in order to derive knowledge related to the current state of the world, (known as pervasive computing). Early examples from the literature in this area cover various physical settings. Schilit, Adams & Want (1994) focus on location, defining context as an awareness of the location of use, the location of nearby people, accessible devices and changes to these aspects over time. Kristoffersen and Ljungberg (1998) focus on the physical context of the user offering the concept of modalities as representation of physical context and ‘modes’ of interaction.

Due to the need to sense the physical reality there is much consideration in this area around ontological-based models through which to describe those physical objects and their attributes. This allows the definition of rules, relationships and hierarchies between objects and information types. The knowledge representation tools used to build such models contribute greatly to their structure, for example the Web Ontology Language, Descriptive Logic (OWL-DL) (Horrocks, Patel-Schneider, & Van Harmelen, 2003). This approach creates comprehensive taxonomies to describe objects, their states and relationships.

2.3.3 Context as social situation

An alternative research approach to context addresses the influence of internalised aspects of human behaviour and social interaction. Greenburg (2001) argues that even if some areas of physical context are stable and perceivable, user centric aspects critical in human decision making may be near impossible to infer from outward observation. Examples include people’s previous episodes of use, the current state of their social interactions and their changing internal goals. More critically, even if such information could be inferred it may still be impractical as an input from which to accurately determine a specific contextual state. Erickson (2002) argues that users are not well served by rule based contextual awareness if those systems look to remove the human from the control loop. Erickson also cites a number of hypothetical every day situations to convey problems that could arise due to the gulf in contextual understanding between a socially cognisant person and an intelligent system when that systems seeks to act on a user's behalf (Table 2.4).

Examples of context aware systems misreading social situations
Spying a news rack, Tom pulls his rented car to the side of the street and hops out to grab a paper. The car recognizing the door has just closed and engine is running, locks the doors.
In the midst of her finely honed closing pitch, Susan's prospective clients watch intently as her screensaver kicks in.
"What a cretin." Roger mutters as the CEO finishes his presentation, unaware that the high tech speakerphone on the table, triangulated on his whisper and upped the gain to broadcast the remark to the meeting's remote audience.

Table 2.4. Problems with the notion of context aware computing (Erickson, 2002, p. 102).

The argument for maintaining human control has driven sociological research away from attempts to define comprehensive contextual taxonomies. Instead this strand of research has centred upon ethnomethodological approaches (Garfinkel, 1967) in order to understand specific aspects of the human experience within particular situations and settings. This is a research agenda which appears in alignment with the views of Greenberg (2001) and Erickson (2002) and which is also supported by the position of Bellotti and Edwards (2001) which is that context-aware systems cannot be designed to act on a person's behalf, they must instead be able to support users actions and defer to them in efficient and non-obtrusive manners. This requires a sensitive appreciation of a user's situation, not reasoned control over the environment.

2.3.4 Investigating viewing context.

There has been considerable investigation into the contexts of video consumption in the literature. The foundation of research addressing viewing is built upon ethnographic studies into television use in the home (O'Brien &

Rodden, 1997; Taylor & Harper, 2003; Bernhaupt et al., 2008; Saxbe et al., 2011). O’Brien and Rodden (1997) identified the significance of structured daily family routines and particularly the seamless integration of television use around those patterns rather than dictating them. Taylor and Harper (2003) identified a sequence of structured periods of viewing during the evening and how the specific viewing strategy employed by users, (such as ad hoc channel surfing or more planned viewing) changed as the evening evolved. Also reported in this study were changes in family dynamics in relation to ownership over the television, and the shared viewing preferences at particular junctures throughout the evening. Bernhaupt et al. (2008) identified that the role and patterns of use for the living room changed dependant upon the age of the users, people in the household, work and leisure patterns and time of day. Through these changes the living room represented both an important social and individual space. This study also reported the common execution of parallel tasks in front of the TV. Saxbe et al. (2011, p. 158) further reinforces the social significance of viewing, finding in their study (which focused on families with children) that 64% of primary viewing was shared with at least one other family member.

A further context of use was the social use of mobile video in the home. O’Hara et al. (2007) described users continuing to spend time together in traditional group viewing situations but engaging in individual viewing behaviour. The example given was a user who sat on the couch next to other family members watching video on a mobile device and listening on headphones whilst others watched the family TV. This behaviour is distinct from the more social activity of actually sharing viewing on the mobile device reported both by Chipchase, Yanqing, & Jung (2006), and Miyauchi, Sugahara, & Oda (2009). This additional behaviour implies extremely close proximity due to the small screen size and limited viewing angle of mobile devices.

Away from the home there is also significant discussion in the literature around mobile viewing context. Several physical situations where mobile video is consumed have been reported. These include commuting on public transport (Chipchase et al., 2006), at work during lunch breaks (O'Hara et al., 2007), in public waiting areas such as airport lounges (Jumisko-Pyykkö, Weitzel, &

Strohmeier, 2008) and additionally in other social situations, such as with friends in cafes (Miyauchi et al., 2009)

O’Hara et al. (2007) reported the use of video consumption on a mobile device as a way for individuals to manage their own (sometimes socially uncomfortable) personal solitude when in shared public spaces. This supports the findings of Tamminen, Oulasvirta, Toiskallio and Kankainen (2004) who reported the use of mobile devices in order to claim personal or group spaces in public areas.

A further use of mobile TV is to fill micro and macro breaks which are the moments of waiting time that occur between planned activities in mobile environments. Examples include waiting for friends to turn up, and filling the last few minutes at the end of a lunch break (Chipchase et al., 2006). O’Hara et al. (2007) highlighted the difficulties of watching in such contexts, as waiting is often associated to transitioning between spaces and this can interfere with the act of consumption or even stop users from deciding to watch video in the first place.

Another finding from O’Hara et al. (2007) was the use of mobile video to time and place shift content consumption from the home out into mobile contexts. In this case the primary reported motivation was simply a wish to free up the time spent at home with family. This behaviour dislocates viewing from fixed television schedules, a trend which has already occurred in many homes through the use of set top box personal video recorders (PVRs) (Dodson, 2004). This practice is profoundly altering the temporal link between broadcast and consumption (Brown & Barkhuus, 2006). However it’s important to note that O’Hara et al. (2007) conclude that moving services from fixed to mobile contexts does not simply transfer the same experience to another location. This is manifestly clear from other research such as Jumisko-Pyykkö and Hannuksela (2008) who identified differences in the subjective evaluation of video quality in different mobile contexts when compared to laboratory conditions. An alternative motivation for mobile video use observed in other literature was actually to reinforce the temporal link between broadcast and consumption (Chipchase et al., 2006). This was manifest as the use of mobile video to stay up to date with real time events and related to specific content types such as news and sport.

Findings from across all the studies noted (both within the home and out in public) strongly align to key definitions for context in the literature. Venkatesh, Morris, Davis and Davis (2003) characterise the home as having three contextual dimensions of technical, physical and social. Jumisko-Pyykkö and Vainio's (2010) extensive literature review related to a definition for mobile context, augment these elements further. Defining two more additional contextual dimensions, the temporal and the task. Considering the elements of viewing context against Jumisko-Pyykkö and Vainio's framework appears useful, as it is clear the interplay of many of the factors from within each of these dimensions have the possibility to influence the video consumption experience. Figure 2.7 provides a summary of their framework, and the remainder of this section considers each of the five dimensions with relevance to viewing context.

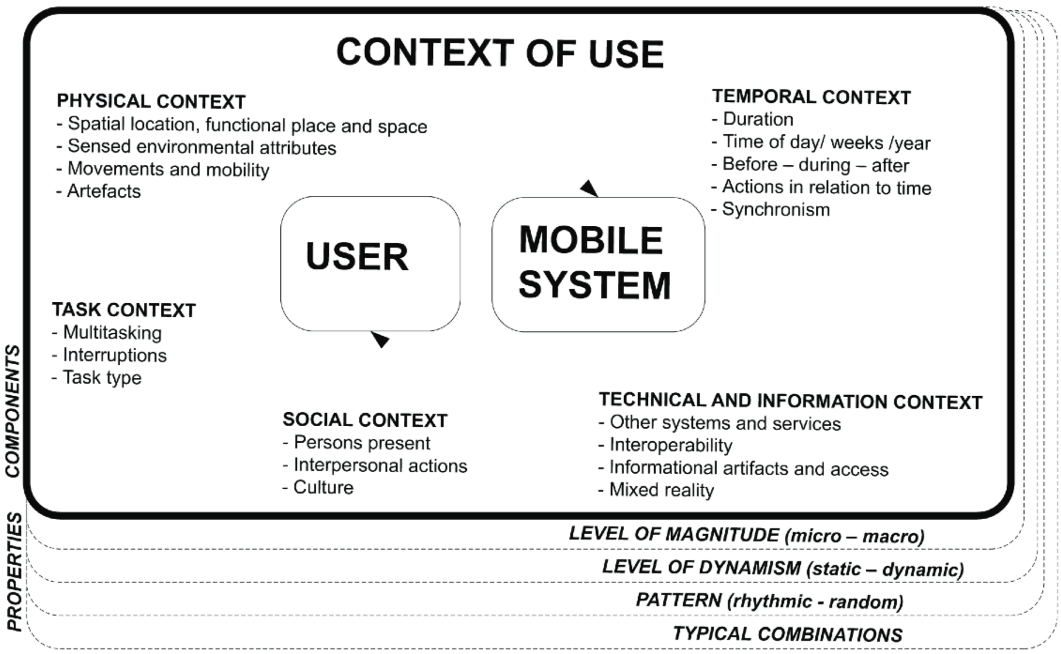


Figure 2.7. A proposed model for context of use in human computer interaction (Jumisko-Pyykkö & Vainio, 2010).

The technical context.

The device used to watch, and its ability to support viewing can affect the context of the consumption experience. Gibson (1977) introduced the concept of affordance, which represents the properties inherent within the physical world as perceived by a user. In the context of products and design, Norman (1990) identifies affordances as both the perceived and actual properties of the designed artefact that determine how it is used. For example Bernhaupt et al. (2008) suggests that on-demand TV is now more like a reference book than traditional TV, due to the way users need to actively locate content within the guide. Outside the home, technical context is also different. Whilst at home we have access to large screen TVs, viewing in public environments is typically carried out on mobile devices with varying screen sizes and image quality capabilities as well as varying technical constraints such as network bandwidth.

The physical context.

Options for viewing locations outside the home are limitless. However when considering the physical it is important to be clear that this goes beyond location. Weilenmann (2003) identifies the concept of mobility as an aspect of physical context, which can relate to both the setting and the user. For example a user could be walking, sitting at a desk or lying down during the consumption experience. Physical context also comprises aspects of the visual and auditory environment which in the context of video consumption brings into play issues such as visual distraction, lighting level and screen glare (Barnard, Yi, Jacko, & Sears, 2007), headphone use, and the environmental soundscape (Williams, Jones, Fleuriot, & Wood, 2005).

The social context.

Studies in the home (Saxbe et al., 2011; Taylor and Harper, 2003; O'Brien and Rodden, 1997) and when mobile (Chipchase et al., 2006; Miyauchi et al., 2009) all highlight the social significance attached to the presence of others in the viewing situation and the interpersonal interactions that occur. Additionally Tamminen et al. (2004) and O'Hara et al. (2007) highlight the use of video consumption as a social mediation tool for controlling personal space and relieving social discomfort in awkward public waiting situations.

The task context.

Users offer different levels of task attention to video consumption in different contexts. Taylor and Harper (2003) identified that mid evening planned viewing attracted higher levels of user attention. In contrast Bernhaupt et al. (2008) reported users frequently conducting multitasking in front of the TV. Tamminen et al. (2004) also identified parallel tasks whilst watching video but this time in mobile contexts. Therefore it is possible to see how the level of attention a user is willing to give to video, (and equally the amount of attention any parallel task may take up) could affect the viewing experience. It's additionally important to concede that attention-grabbing elements may not always be present by choice, and in some circumstances are in fact interruptions (Speier, Valacich, & Vessey, 1997).

The temporal context.

A number of temporal issues have implications for viewing experience. Tamminen et al. (2004) introduce the concept of temporal tensions, which they describe as the fluctuating relevance and importance of the time you have available in respect to your plan for the day. Additionally there are the temporal components of days of the week and time of day. As example Taylor and Harper (2003) identified a configuration of viewing modes that followed a temporal pattern from coming home, through to later evening viewing. There is also a related observation of TV use being aligned to family routines and families using the TV as timekeeper (O'Brien & Rodden, 1997).

All these studies offer interesting insights into video consumption context within a diverse range of settings. They provide relevant pathways into the investigation of context from the perspective of this research. Perhaps the most significant insight is that evolving mobile technologies are opening up new viewing opportunities both in terms of how and where content is consumed. This is aligned to Ito's (2006) concept of techno-social situations of use. The boundaries of previously distinct practices and behaviours embedded in particular social situations are now being crossed by the emergence of new media technologies. This creates new situations of use with new social meaning. A further insight from the literature is that social situatedness overrides physical location. A clear example was Tamminen et al's. (2004) observation of the use of the mobile device to claim personal space. This specific user action is applicable to many different physical locations, however the social significance of the situation is apparent to the user and this in turn drives consistent behaviours. Therefore an investigation of user perceptions of situated viewing rather than a rigorous analysis of the physical situation, may be a more fruitful and user centric approach to defining viewing context.

2.3.5 Situatedness

Situatedness is a paradigm from cognitive science and could offer a useful way through which to consider viewing context. Rohlfing, Rehm and Goecke (2003, p. 134) define situatedness as:

> *"specific situations in which actions take place."*

They describe a model in which context influences how a situation is analysed by a user, (Figure 2.8) and determines the appropriateness of the situated actions they carry out. They cite two components of context:

- Inter-context (Clancey, 1993) is the product of all interactions, both between individuals and between individuals and objects. Semin and Smith (2002, p. 385) define inter-context as the *"socially shared reality"* which is the resultant social phenomenon of shared knowledge available from the actions of all.

- Intra-context is our personal internalised model of appropriate contextual behaviour, built from our own attempts to make sense of the situations we encounter.

Intra-context is influenced by inter-context because it is in the midst of specific situations where socially shared reality manifests itself. In turn intra-context feeds back into inter-context as by the act of deploying those models in the world, those actions themselves add to the socially shared reality of the situation.

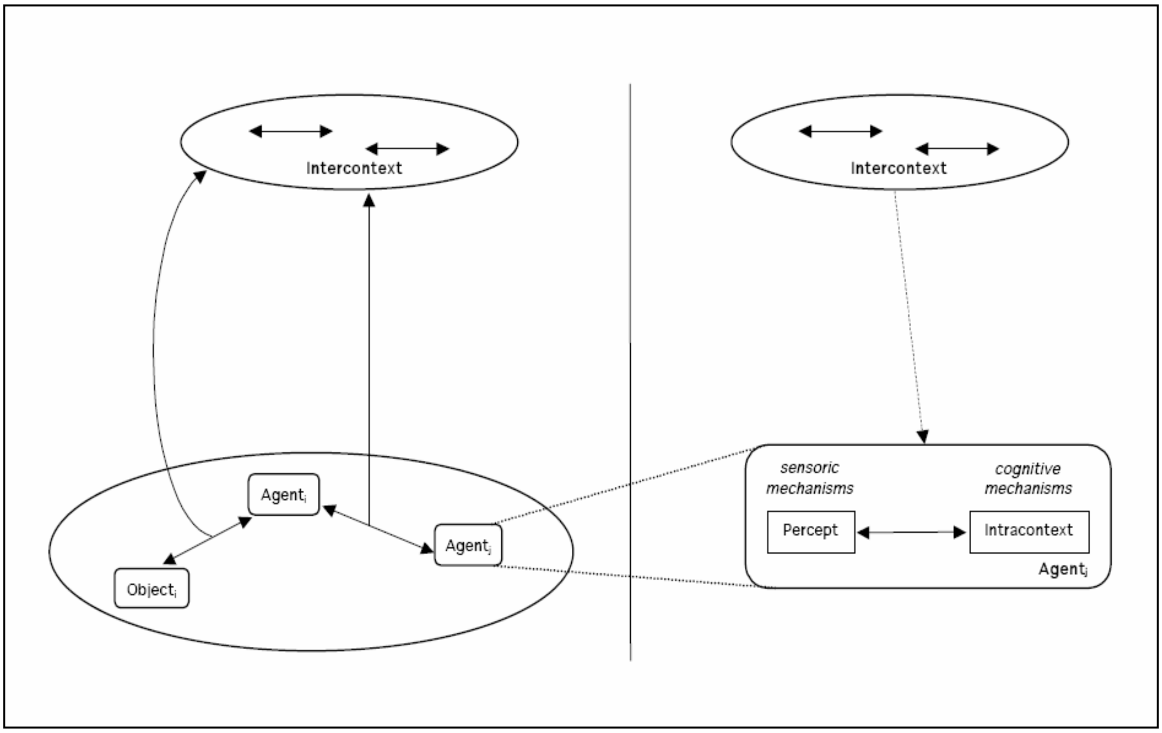


Figure 2.8. Inter-context and intra-context. (Rohlfing, Rehm & Goecke 2003).

The concept of Situatedness has many parallels to expectation theory (Roese & Sherman, 2007, p. 91). They define expectation as:

> *"Beliefs about a future state of affairs, subjective estimates of the likelihood of future events ranging from merely possible to virtually certain."*

The source for expectancies as described by Olson, Roese & Zanna (1996) are direct personal experience, communication from other people (indirect experience), and beliefs that are inferred from other beliefs.

Common to both expectancy theory and situatedness is that though many contextual elements occur and are experienced in the external world, the meanings of those elements are created and held in the mind of the user and manifest as perceived situation (Magnusson, 1981). We can best describe this through a hypothetical scenario that is provided here by the author rather than taken from the literature. It is lunchtime in David's office and people are quietly working at their desks. Suddenly another person's laptop starts to play a video advertisement on a webpage very loudly. Everyone turns around to look and offer glances of disapproval. The person in question looks very embarrassed and quickly mutes the sound. The next time David decides to surf the net in work he mutes his sound before visiting any site with video to avoid a similarly embarrassing incident befalling him. The outwardly observable aspects of context, (the quietness of the location, the behaviours of the other workers and the events which occurred) are the inter-context. David uses this information to form an appropriate model (intra-context or perceived situation) for his own behaviours.

Rohlfing et al. (2003) argue that the abstraction of intra-context away from the specific context it was gained within is a learning step. Its creation was influenced by the inter-context in which that situation was embedded and the interpretations of behaviour it provided. Thus the perception of similar inter-contextual cues in different yet analogous situations leads to reuse of given intra-contextual models. For our example, David might deploy the same model of behaviour gained in the office upon entering a quite train carriage as he perceives similarities in the situation. Therefore an instance of situatedness is the application of a learnt personal model of behaviour and action in response to the perceived situation. This approach emphasises the importance of the user's perception of situation, demoting the significance of explicit external physical aspects of context. Therefore the consideration for a system is no longer characterising the context itself but understanding the cues that trigger how the user chooses to perceive it.

This contradicts the approaches to contextual awareness that focus on the physical environment (discussed earlier in this section). But for applications where the primary utility offered is less well associated to the geography of the physical world, an understanding of the perceived situation may in fact be more useful. The findings from the Tamminen et al. (2004) study concluded that absolute time and place are over emphasised in mobile contexts. In fact it is the perceived situation the users found themselves within that was of greater relevance.

2.3.6 A definition for viewing context.

For the purposes of clarity within the research, it was useful to take a methodological position on viewing context. Providing a definition assisted in designing studies within the research. Firstly the author provides a definition for the components that contribute to the creation of viewing context, based primarily on the approach of Jumisko-Pyykkö at al. (2010):

The components of viewing context are the physical, social, temporal, task and technically related elements that manifest as context cues within the viewing environment. By their presence, context cues create situation in the mind of the user.

We can then further define viewing context itself based on Rohlfing et al. (2003), Roese et al. (2007), and Magnusson (1981) as:

The perception of situation, based upon the user's own beliefs and subjective responses to the presence of context cues within the viewing environment. In turn, the beliefs users hold in relation to context cues are formed by their past experiences, the experiences others have shared with them and additionally other beliefs they hold which relate to experiences created in other contexts with similar context cues.

Advocating the consideration of situation as an approach to understanding context has precedence. Harrison & Dourish (1996, p. 69) introduced the idea of re-place-ing space. This concept suggests contextual significance is not bound in spaces (three dimensional locations) but instead places, which are;

"*mutually held and mutually available cultural understanding about behaviour and action*".

This definition has much in common with the idea of inter-contextual cues. The overlaying of perceived place (our shared understanding of behavioural appropriateness) onto physical space affords two important features in understanding the interplay between context and UX:

- Dissimilar spaces can be imbued with similar notions of place and thus result in similar instances of perceived situation.
- A notion of place that is related to a given space can dynamically change over time.

There are relevant examples in the literature of video consumption spaces which change place over time. Taylor and Harper (2003) described the change of moral ownership over the family television through the course of the evening, and the different situations this creates. The family living room and associated television (the space) does not change, yet through evolving social, temporal and task elements, the situation (the place) does.

2.4 Context within adaptive systems.

The purpose of adaptive systems is to predict the personal preferences of the user within given contexts and ultimately mimic the naturalistic preference adaptations of real people. Koutsorodi, Adamopoulou, Demestichas and Theologou (2006, p. 2) state that in developing adaptive systems:

"*the user's behaviour and preferences are not randomly decided upon but rather comply with some implicit logic, which we are trying to approximate*".

Coutand (2009) summarizes the ways adaptive technologies can be applied to improve the experiences for users, these include:

- Adapting interfaces to modify the display of information (Browne, Totterdell, & Norman, 1990).
- To offer help to users dependent upon their levels of experience (Benyon, 1993).
- To help users to locate relevant information (Korfhage, 1997).
- To recommend content and products that will be of interest (Resnick & Varian, 1997).

Characterising and understanding the contexts of video consumption within a technically implementable framework offers the possibility to improve adaptive systems. Some researchers and system designers have begun to tackle issues surrounding how preference adaptation relates to context within technical systems design. Partridge and Price (2009) found that recommendation systems could be enhanced through the addition of models of high-level contextual activity. Indeed information regarding user behaviour in given contexts has long been investigated as an approach towards improving personalised systems in a number of research areas, (see Breese, Heckerman and Kadie (1998) and Ungar and Foster (1998) for early examples).

Traditionally adaptive systems have focused on the association between the user and a set of items of interest. Therefore this relationship can be modelled in two dimensions. Systems that strive for context awareness need to additionally consider the influence of context, and therefore require a multidimensional approach (Zheng, Burke, & Mobasher, 2012a).

Returning to our earlier discussions around the nature of viewing context in section 2.3, through the definition of Jumisko-Pyykkö et al. (2010) it is clear that the elements of context which influence perceived notions of situation are numerous and diverse. Within systems striving to offer contextual awareness (such as those within the recently emerging field of CARS) the importance of identifying contextual factors is therefore being recognised. Adomavicius, Mobasher, Ricci & Tuzhilin (2011) assume the existence of contextual factors and note their impact on the accuracy of the user profile and recommendations an adaptive system can provide. Lombardi, Anand & Gorgoglione (2009) found considerable improvements in the accuracy of their system when contextual factors were additionally considered in the technical model.

Zheng, Burke & Mobasher (2012b) provide an overview of the approaches researchers have taken to identify influential contextual factors for integration into adaptive systems. Examples include Baltrunas, Ludwig, Peer & Ricci (2012) who developed on online survey asking users to rate their responses to imagined travel scenarios, when changes in context were described. This was done in order to understand which contextual factors affected user preference. This approach follows earlier attempts to uncover contextual factors for technical implementation using survey (De Pessemier, Ide, Deryckere, & Martens, 2008). Vargas-Govea, Gonzalez-Serna and Ponce-Medellin (2011) took a reductionist approach, initially defining a wide range of possible contextual factors in the form of service, user and environment attributes and then refining the influence of individual factors within the model as users built up profiles. This methodology closely follows similar approaches to identifying context factors as provided in earlier literature including Adomavicius, Sankaranarayanan, Sen and Tuzhilin's (2005) multidimensional approach to context. Hariri, Mobasher, Burke and Zheng (2011) introduce a further strategy, using data mining techniques to derive context from written reviews left on websites.

Critique of approaches described in the literature.

All of the design approaches noted in the section above have limitations. Baltrunas et al's. (2012) survey approach requires considerable effort from the user to provide ratings (Zheng et al., 2012b). However probably a greater concern in using surveys to solicit behaviours is the validity of the information used to build the model. There is a large body of evidence in psychological research that shows a variance exists between reported intention and actual behaviour, (see Armitage and Conner (2001) for a review of the literature). Therefore building a model of context based solely on what people say they do rather than on data addressing what they actually did is limited from the outset.

The reductionist approaches of Vargas et al. (2011) and Adomavicius et al. (2005) are also limited. Firstly, this methodology takes no account of the decision-making strategies individuals use in different contexts. This introduces the very real possibility of missing factors that affect preference due to the lack of a user centric approach to the inclusion of candidate contextual factors. Secondly, starting with a large number of factors makes data collection and processing unnecessarily intensive. Finally this approach introduces an issue consistently raised in the recommendation literature, that of data sparsity (Good, et al., 1999). In order to identify the contextual factors influencing preferences, the feedback provided by users needs to be dense enough across all of the contextual factors analysed to make correlations reliable (Zheng et al., 2012b). For users to provide this level of explicit feedback takes effort and so in the real world this rarely happens, or at least is a very slow process.

A way to improve data sparsity is to move to implicit feedback methods in which information is gathered from monitoring secondary sources of user information rather than requesting users to provide explicit feedback. One such technique is the data mining method of Hariri et al. (2011). Though an interesting approach, data mining text has only limited relevance to applications that do not have a textual component to the user activity (watching video, for example).

This difficulty in identifying contextual factors has moved some researchers away from attempts. Karatzoglou, Amatriain, Baltrunas & Oliver (2010) introduce the idea of a generic collaborative filtering based approach with scope to add any number of contextual factors into the calculation through tensor factorisation. Baltrunas, Ludwig & Ricci (2011a) build on this work through the concept of Matrix factorization, which offers a further improvement in the trade off between accuracy to computational effort and data complexity (Silva, Alves, & Bressen, 2012). Once again these approaches represent interesting technological advances in reasoning techniques. However, because they take a generic approach to context as only a constraint within the reasoning algorithm they provide no insight on which contextual factors to consider, or the inter-relationships between those factors and lower level observable contextual information. When these techniques are applied to applications in the real world, (Shi, Larson, & Hanjalic, 2010) the contextual factors input into the algorithms are formulated without any understanding or attempt to gain first hand insight of the user's perceptions or behaviour. Silva et al. (2012) offer evidence for the lack of user centred insight in technical systems described across the literature. They present a system for contextual presentation of TV recommendations but fail to engage in a meaningful analysis of the contextual elements specific to viewing.

Whilst there are many novel approaches towards the consideration of context in the technical frameworks and user models reviewed, there is currently scant consideration for the reality of the user's situation and own perception of context. The scarcity of truly user centred approaches is puzzling in consideration of the body of ethnographic research surrounding contextualised user behaviour (see section 2.3 for a recap). Baltrunas, Ludwig and Ricci (2011b) provides insight on the possible methodological mismatch, commenting that whilst there is a vast qualitative library of consumer behaviour in the literature, the insight it raises can only be a starting point to understanding the quantitative dependency to the user preference. This highlights the translational issues of integrating qualitative research into executable code. This issue perhaps explains why the focus of the coding community has been on improving reasoning algorithms rather then coming to terms with understanding context from a real world experiential perspective. Hariri et al. (2011, p. 27) comments:

> *"Some existing works assume that the user context is explicitly specified, just focusing on how to use it in the recommendation process. While this assumption helps simplify the system, it does not hold for many applications in which context is hidden and should be somehow inferred".*

Whilst technical approaches have undoubtedly progressed the accuracy of reasoning algorithms and there ability to cope with an ever diverse set of variables, the author believes it has come at the cost of deeper analysis of the subtle user focused aspects of context. As a consequence the real world utility of the preference models built and used by systems is reduced.

3 Methodological Approaches

3.1 Introduction

To meet the aims of the research, studies were needed to investigate both viewing context and its relationship to viewing UX. This required the capture of outwardly observable aspects of viewing consumption in order to identify both the cues that define viewing context and those environmental factors that effect viewing experience. In parallel, methods were also needed to capture the user's inner subjective perceptions towards the quality of the experiences created. The aims of the research additionally suggested the need for a method to compare user perceptions, as contextual factors need to be not only richly understood but also their effects on UX measured.

3.2 Mixed methods as an approach

As the research aims require both the gathering of rich insights and quantitative measurements, a mixed methods approach was needed. Mixed methods represent a pragmatic approach to applied research. It brings together the quantitative elements of deduction, statistical analysis and confirmation with the qualitative elements of induction, discovery and hypothesis generation, (Johnson & Onwuegbuzie, 2004).

Combining information from the two approaches allows the creation of complementary views (Greene, 2007) that provide a fuller understanding of the area under investigation. Through this process, complementary study designs can compensate for the weaknesses of using any one method in isolation (Tashakkori & Teddlie, 2008).

Mixed method approaches are typical in studies related to investigating UX, as single measures offer only limited assessments of the rich, multi-dimensional experiences typical of user interactivity (O'Brien & Toms, 2013). Relevant examples from the literature relate to understanding the use of technology at home (Haddon, 2006), understanding user requirements for video quality (Jumisko-Pyykkö, Weitzel, & Strohmeier, 2008) and providing insights on video consumption behaviour (Obrist, Meschtscherjakov, & Tscheligi, 2010; Pirker & Bernhaupt, 2011).

The remainder of this section comprises of a review of methods considered for use within the research and related methodological issues. The final section of this chapter offers a summary of the methods employed within the studies executed and ethical considerations to conducting the research. This also provides signposting for where the specific method protocols for each study are discussed in more detail throughout the thesis.

3.3 Investigating context.

Although technology advances in mobile computing have created substantial interest in the concept of contextually aware applications and services, as Dourish (2004) notes, there remains considerable confusion and disagreement surrounding the notion of what context actually means. One of the major confusions has been created by the competing disciplines from which the concept of context within ubiquitous computing has evolved.

On one side is a physical definition, which allows system developers a way to conceptualise aspects of the world in terms of the relationship between specific human actions, environmental conditions and appropriate and corresponding computational decisions (Schilit & Theimer, 1994). The other approach is from social science which draws attention to the significance of given social settings in relation to human behaviours. Within this approach, the emphasis is on manifestations of social interaction and the meanings and knowledge that can be yielded from their analysis (Jameson, 2001).

These two perspectives manifest themselves as differing research approaches, however research methods selection should be influenced by the aims of the study (Pederson & Ling, 2002).

The physical approach to context has attempted to simplify and categorise context. The focus is to model context, developing spatial models for the elicitation of context information and supporting ontologies through which to classify it. However a significant consideration in relation to the aims of this research was the need to gain a rich understanding of viewing context before any attempt to simplify or categorise it. This suggests a social sciences approach, focusing on understanding the user's psychological state and social situation. From this, reasoning technologies are required to deal with the inherent uncertainty of inferring circumstances that cannot be directly observed.

This raises the question of how best to approach data collection across the wide range of situations in which viewing occurs. Video consumption is now not only ubiquitous in nature but also in some contexts (e.g. commuting) highly mobile. As Mitchell (2005) notes, the challenges of investigating mobile contexts are similar for all researchers, and as such lessons can be learnt through comparisons of different approaches.

3.3.1 Situated observation methods

Systematic observation

Systematic observation and subsequent analysis of user behaviours is an established data collection method within user centred design (UCD) processes (Preece, Rogers, & Sharp, 2002). It is employed to collect data related to the context of use, interactions between users, and user's experiences with products. This method has its roots in social psychology and fundamentally attempts to capture the visually observable reactions of the user.

Bakeman (2000) describes a systematic observation and analysis method based on the identification and objective measurement of behavioural cues. Observations are coded against predefined schemes developed to answer the research questions posed (Bakeman, Deckner, & Quera, 2005). Bakeman et al. suggests this method is particularly useful when the behaviour of interest is social (between two or more participants), or when the aspect of interest is not so much the outcome of an interaction but rather the means by which it unfolds over time. Systematic observational methods have been used in a number of related previous studies. This includes studies in which user activity has been coded both in real time and also post hoc from captured video. Examples included studies within the general research domain of entertainment (Read, MacFarlane, & Casey, 2002; Lindley, Le Couteur, & Berthouze, 2008), capturing the nature of social interactions whilst watching television (Oehlberg, Ducheneaut, Thorton, Moore, & Nickell, 2006), and to measure levels of engagement with media (Holmes & Bloxham, 2007).

Systemic observation and analysis methods can provide quantitative measures and comparable insight across the behaviours captured. This can offer useful information on both observable experiences and context of use, especially in relation to capturing factors in the environment that may influence UX. However when used in isolation, observation does have drawbacks. As the information that can be collected is by definition external, it cannot provide any detail regarding the internal motivations for the observed behaviour of the users. O'Brien and Toms (2010b) raise this issue, arguing for example that a user observed looking at a single screen of an application for a length of time could be deeply engaged with the content, or simply confused about how to navigate away. Therefore observation alone offers an incomplete assessment.

Observation however has great utility as a complimentary method. Indeed Bakeman (2000) states the benefits of using observation as a validity check for pencil and paper measures. Likewise, complimentary subjective insights on a user's motivations can provide context and meaning to data drawn from observed behaviour. Thus observation has merit within a mixed methods approach.

A more significant issue in relation to the suitability of utilising systematic observation and analysis methods is its rare use in real contexts of use. Collecting and measuring observational data from a variety of real world viewing contexts presents a significant logistical challenge. Of the studies noted in the section above which employed systematic observation and analysis techniques, only Holmes and Bloxham's (2007) was executed in the real context of use. The other studies noted use lab environments, artificially created for the purposes of study and designed to ease the processes involved in data capture. However even the most apparently mundane real world scenarios such as in the car, office or at home cannot be reasonably approximated in the laboratory (Consolvo & Walker, 2003). Due to the importance of capturing viewing context in this research, validity would be an issue if data collection had occurred in a lab rather than the user's context. However capturing such data in situ is challenging. Holmes and Bloxham's method required the effort of a number of researchers shadowing users in their day-to-day activities, coding observed behaviours in real time using an electronic mobile device. This prospect raises both feasibility issues and ethical considerations that would need to be addressed within the research design. Nevertheless, methods are needed which are usable within real world contexts.

Observation as a component of ethnography

Researchers interested in understanding the real nature of video consumption have evolved methods to explore viewing in context. Behaviours in the home (and particularly whilst watching TV) have long been an area of interest for social scientists and media studies researchers (Silverstone, 1994; Lull, 1990; Hobson, 1980). The goal of understanding the rich culture and social dynamics that surround television use in the home has typical led researchers towards ethnomethodological research approaches.

Angrosino (2007) defined ethnography as the description of human institutions, interpersonal behaviours, productions and beliefs. The goal of ethnographic approaches is to create rich qualitative descriptions of complex human behaviour within a given domain from the perspective of those being studied (Garfinkel, 1967). In order to provide insight from such a perspective, the researcher themself must therefore become immersed in that culture (Robson, 2002), participating in and directly observing practices in order to analyse habits and behaviours.

When investigating technology in the home, there is an argument that usage cannot be separated from the complex social, cultural and technical networks that exist there (Venkatesh, 2006). Therefore to understand the meaning and significance of technology use in the home, rich qualitative ethnographic methods are required (Haddon, 2006; Bernhaupt et al., 2008). There have been numerous relevant examples in the literature of researchers taking this approach, visiting people at home to directly observe viewing routines, technology use and family life from within the user's context (O'Brien & Rodden, 1997; Taylor & Harper, 2003; Crabtree, et al., 2003).

This methodological position, combined with the fact that more objective lab based approaches to observation were initially constrained by the immobility of monitoring equipment, led to ethnography also being particularly positively adopted by the mobile services research community. Luff & Heath (1998) and Perry, O'Hara, Sellen, Brown & Harper (2001) both took an ethnographic approach to mobile research. There are also examples in the literature establishing shadowing (where the researcher follows the user as they move through the environment) as an observation method for ethnographic research in mobile environments (Södergård, 2003; Tamminen et al., 2004).

Much of the research related to viewing context has been derived from studies based on social science ethnographic approaches (O'Brien & Rodden, 1997; Taylor & Harper, 2003; Bernhaupt et al., 2008; Saxbe et al., 2011). These studies have shaped current thinking around the nature of video consumption behaviours both in the home and on the move. The data they provide is rich and detailed in terms of describing the contexts of use and documenting examples of user behaviour. Although studies of this type have now been widely accepted in the HCI community, from a design perspective there have been questions raised about their ultimate usefulness (Dourish, 2006; Harper, Regan, & Rouncefield, 2006). Arguments against this approach originate from a perceived mismatch between the detailed and rich output of ethnography and a designer's need to simplify the complexity of real life (Hughes, O'Brien, Rodden, & Rouncefield, 1997). Therefore the extent and process through which ethnographic research directly influences design remains an area of discussion (Blomberg & Karasti, 2013; Crabtree, Rouncefield, & Tolmie, 2012).

Deploying researchers directly into the user's context (as ethnographic practices require) also raise some methodological challenges. Väänänen-Vainio-Mattila & Ruuska (1998) documented some of these considerations. The most pertinent (from the perspective of this research) is that many of the consumption contexts of interest to study were either highly mobile or highly private. Both of these scenarios raise their own issues. Highly mobile scenarios could require study over wide geographies and extended time periods, putting great strain on the research in terms of logistics. Väänänen-Vainio-Mattila et al. (1998) cite this as a difficulty they faced in their own studies. Collecting data from private locations raises different issues in terms of gaining access to users, ensuring personal safety and guaranteeing participant privacy. Whilst Weilenmann (2003) argues that observation within public domains is justified on the basis that the parties being observed are aware of the likelihood of their actions being watched by others, the same cannot be said regarding observation within private spaces. Venkatesh et al. (2003) comments that the home is not an easy place to investigate, as it is a private and personal space. Though consent from the user would of course be mandatory in such circumstances, the likelihood of finding participants happy to invite a researcher into their private home and work environments to directly observe them is low. Väänänen-Vainio-Mattila et al. (1998) reported that the confidential nature of many people's employment limited their ability to recruit users they could shadow in the workplace. Even if participants could be found who were happy to be shadowed by a researcher across all the environments in which they watch video, it is unlikely in such contexts that the presence of the researcher would not affect the validity of the observations. This is the widely known phenomenon of experimenter effects described amongst others by Rosenthal (1976).

Dealing with experimenter effects

Whilst experimenter effects can be an issue in all research, they raise a particular problem for ethnography due to the obvious and unnatural presence of the researcher in the user's personal context. Stoddart (1986) proposed six strategies to overcome the methodological challenges, all of which were aimed at allowing the ethnographer to become invisible. Most relate to the erosion of visibility over time, either by remaining in the context for a long duration or by becoming part of the context itself by taking an active role in the activities under investigation. As example, a researcher investigating viewing in a social environment such as the screening of sport in pubs could watch alongside the participants being observed. In relation to investigating private viewing contexts both of these strategies are not particularly relevant. Another of Stoddart's strategies is to achieve invisibility through personalising the ethnographer - informant relationship. This is where a participant's focus on their concern about being observed is superseded by perceptions of the researcher as a likable and familiar person. However building such relationships requires huge investment by the investigator and very accommodating study participants.

3.3.2 Non-situated observation

The issue of experimenter effects when combined with the logistical issues of placing researchers directly into the user's context, leads to the consideration of alternative methods. Mitchell (2005) notes that the decision to situate the researcher within or outside of the user environment during data collection is a key factor in methods selection.

Remote observation

Removing the researcher altogether from the environment offers the best opportunity to minimise experimenter effects. Observational data can instead be collected remotely, for example via video cameras. Whilst this method has been used before in domestic environments (Cornwell et al., 1993; Crabtree &

Rodden, 2004; Darnell, 2007) it raises further logistical challenges in relation to capturing data from mobile environments. Though Weilenmann (2003) argues that useful data could still be collected using such methods, tracking users across geographic locations in such a way with cameras is impractical. There are also additional ethical issues with this method in relation to maintaining user privacy. With a researcher present in the environment at least participants are aware that they are being observed. It is unlikely they will be able to obtain the same level of awareness of if cameras placed in the environment are filming them or not.

Self captured video

The considerations noted above lead to a third related observation method, asking users themselves to directly capture the data on behalf of the researcher. This solution provides benefits both from an ethical standpoint of maintaining user privacy and from a pragmatic approach of obtaining user participation. The removal of the researcher from the environment eliminates the effects of having a stranger observe private interactions. However by giving the user control over the episodes they choose to capture, user privacy is maintained.

Possibly the most useful and convenient way for users to self capture observation data across a range of locations is by the use of a small mobile video camera. There are precedents for the use of this method in mobile contexts (Licoppe & Figeac, 2013; Zouinar, Relieu, Salembier, & Calvet, 2004; Mark, Christensen, & Shafae, 2001). Licoppe and Figeac (p.2) argue video recordings made by portable devices offer a promising method as they:

> *"constitute a powerful way to obtain naturally occurring data in a way that is sensitive to the context of use."*

However Mark et.al. (2001) argues that this method is susceptible to validity issues as in order to maintain privacy we must give the user control over which episodes of use to film. As decisions related to recording then become a conscious decision, this interferes with the action under observation. However an alternative perspective is that artificiality can be beneficial, as additional information or context provided by users due to controlling filming themselves can provide ‘thick descriptions’ of behaviour and activities (Neale & Carroll, 1999). We need to weigh the concerns or otherwise of self captured video against the validity issues, logistical constraints and ethics of direct observation. As O’Brien and Rodden (1997, p. 252) acknowledges, introducing a field worker into private environments is extremely difficult:

> *“Quick and dirty ethnography tends to involve several days of continuous fieldworker presence…a degree of intrusion likely to be considered at best undesirable and at worst wholly unacceptable if replicated within a domestic environment.”*

As such, pragmatic and practical approaches towards method selection need to be considered.

3.3.3 Complimentary methods in a mixed method approach.

Beyond observation, a variety of qualitative and quantitative methods have been used to investigate viewing context and viewing UX. Typically these are used in wider mixed method approaches as complimentary methods.

Cultural Probes

Cultural probes (Gaver, Dunne, & Pacenti, 1999) are a methodological variant of traditional ethnography, with the approach having the same goals. Hemmings, Clarke, Rouncefield, Crabtree and Rodden (2002, p. 44) describe cultural probes as being designed to:

> *“Provoke, reveal and capture the motivational forces that shape an individual and his/her home life”.*

Gaver, Boucher, Pennington & Walker (2004) argue that rich ethnographic approaches are especially useful for eliciting insights when designing for pleasure, and Hemmings et al. (2002) stress the participatory emphasis of the cultural probe method as a joint construction between the participants in the home. As with other ethnographic methods, cultural probes are typically used early in the design process to understand the user's context of use (Jääskö & Mattelmäki, 2003).

Where cultural probes depart from traditional ethnography is that they generally do not seek to participate in or directly observe user behaviours. Instead this method relies on the users themselves to collect rich pictures of use through documenting their own behaviours using a supplied "toolkit" developed to elicit such insights. The toolkit can consist of elements such as diaries (described later in this section), cameras, postcards, maps and other means to elicit data from participants (Gaver et al., 2004). Bernhaupt, Weiss, Obrist and Tscheligi (2007) additionally introduce the concept of playful probing as a variation to the established method of cultural probing. Bernhaupt et al. (2008) argues that the natural interaction and elaboration that occurs between people during game play makes the method particularly useful when seeking insights around technology used within a multiuser environment.

The cultural and playful probe methods still offer the opportunity to understand the participant's experiences in situ (as data is collected from the context of use). However the method negates the issues of experimenter effects as the toolkits are returned to the researcher for analysis elsewhere. Probes thereby provide a further alternative approach to overcoming the issues to placing researchers directly into the user's context, and as such have been used considerably for studying user behaviours in the home (Carter & Mankoff, 2005; Bernhaupt et al., 2008).

Pirker and Bernhaupt (2011) argue that using probes as part of the design process offers advantages over ethnographic methods, as whilst traditional ethnography is focused on understanding situations, it does not provide insight on how to design something. Pirker and Bernhaupt's approach to probe design instead leads users to think in terms of problem identification and design concept generation. However interpreting probe feedback is highly subjective in nature. The resulting uncertainty in forming concrete conclusions from the user responses is considered an asset by some researchers as the open ended conclusions challenge design assumptions related to the usage context and how participants live in it (Boehner, Vertesi, Sengers, & Dourish, 2007). However Gaver et al. (1999) state the purpose of probes is not to provide an objective account of the users needs, nor to define a set of problems.

This ambiguity in the relationship between probe findings and design decisions leaves the method open to the same criticism levelled at ethnography more generally in terms of it's ability to meaningfully effect design. As evidence Bernhaupt and Pirker (2013, p. 643) report that despite extensive use of probe methods as part of their UX activities for new iTV products, and the insights being iteratively fed into design processes:

> *"…the levels of customer frustration and dissatisfaction with the finished systems demonstrated a user experience far below expectations".*

The interview

Interview can be defined as conversation with a purpose (Berg, 2006). Whilst observation can provide objective information upon the actions of the user, it will not provide subjective insights in relation to their internal goals and motivations. The focus of interview in this context is to provide authentic insights into people's experiences (Silverman, 2001). In terms of studying contextualised behaviour the validity of interview as a data capture method suffers (as do other methods which are not situated in the user's context), as it cannot capture contextual detail (Mitchell, 2005). Licoppe and Figeac (2013, p. 2) identify this issue in terms of the value interview can bring to contextual system design:

> *"Interviews are rich in terms of context awareness and user experience, but are post hoc narratives with at best only a loose relationship with the fine details of the actual situations".*

The utility of interview in relation to understanding context is when it is used in parallel to other methods. O'Brien, Rodden, Rouncefield and Hughes (1999) note interview as a powerful tool to retrospectively gather accounts of user behaviour when access to the field is limited. Interview is widely used as a complimentary method (Mitchell, 2005) and has been utilised extensively in studies investigating usage behaviours around video, television and mobile (Taylor & Harper, 2003; Södergård, 2003; O'Hara et al., 2007; Bernhaupt et al., 2008).

An advantage of interview is flexibility. The method can be used at all stages of research, with both questions and methodological structures tailored to the specific context and research aim (Rubin & Rubin, 1995). There are logistical uses for interview too. Designing studies with exit interviews can abate participant drop off (Bernhaupt et al., 2007), whilst interviewing in the middle of fieldwork data collection can also engender renewed engagement and sustain participation. This strategy has been used in video related field studies (Basapur et al., 2011).

Berg (2006) lays out three alternative structures for interview design, ranging from formal standardized approaches with defined question sets and strict scripting protocols, to informal and unstandardized approaches with no set questions and open ended aims. Semi-standardized interviews offer a compromise between these two approaches, starting from a set of pre-defined questions but allowing the interviewer to clarify questions, probe for more detail and pursue new lines of enquiry as needed.

Berg also describes qualitative analysis techniques for interview data based on content analysis. The approach is based on open coding (Strauss, 1987) to extract topics, issues and themes grounded in the data. Whilst a formal approach is described with interviews being transcribed verbatim to allow analysis, the most critical aspect stressed by Berg (2006, p. 135) is that data should be analysed systematically so that:

> *"naturally arising categories are used rather than those a particular researcher might hope to locate."*

However in mixed methods approaches it may also be appropriate to use interview data as part of an integrated complementary approach (Greene, 2007). As such, interview data may be blended with other data types to investigate different aspects of the same phenomenon. Greene argues in such cases that data should be collected concurrently so that the aspect of interest does not change, and that data should be analysed jointly with connections being made between data of different kinds during the analysis process.

On this basis we could envisage interview transcripts being analysed in two ways. Firstly, relevant sections from transcripts could be used to contextualise, explain and extend observational data, creating blended narratives for the actions observed. Secondly an open coding and categorisation of interview data would provide a more objective analysis of the information, highlighting additional, original or non-observable issues and themes.

An extension to traditional one to one interview is the focus group interview. In this method small groups of individuals are brought together by the investigator to discuss a particular topic as a group (Schutt, 2003). Berg (2006) notes the approach as useful in triangulated mixed method approaches. Stewart and Shamdasani (1990) list numerous suitable uses for focus groups. Amongst those, two are used extensively in HCI design research. The first is to obtain general background information about a topic, and the second is to interpret previously obtained qualitative results. This second use is commonly seen in the exit procedures for fieldwork data collection, as it offers the opportunity to ask participants to both provide comment and explanation for their own behaviours and reflect on the experiences of others (Ickes, Bissonnette, Garcia, & Stinson, 1990). The group interview in this context could be designed to provide verification of any quantitative measurements or observation data collected from the field, and augment that data through the addition of rich descriptive accounts of user's experiences.

Diary methods

A further requirement for studies related to video consumption will be to understand where, when and how content is watched. Therefore a quantitative picture of a user's viewing behaviours needs to be captured. Understanding this will be a key concern for any investigation into viewing context and viewing behaviour. Whilst observation data can provide detailed information on particular instances of use, further complementary methods are needed to provide a record of use, as natural usage is by nature irregular and occurs at times when observation is infeasible (Carroll, Howard, Vetere, Peck, & Murphy, 2002).

Diary studies provide an alternative method through which to understand user behaviours in situ. Participants are asked to provide a succinct log of their behaviours over the period of a study in the form of a diary. This form of data collection is a long-standing methodology in human computer interaction research (Kirakowski & Corbett, 1990).

As the participant again collects data in situ when using the diary method, the constraints on fieldwork data collection and privacy issues created by placing researchers in the user's context are ameliorated. Carroll et al. (2002) states the goal of diary is to create as near as possible a factual record of use. As such, the method complements rich, yet incomplete pictures of usage captured through observation.

In the traditional diary methods documented in the literature, participants are asked to create records of use, usually using a paper based form designed specifically to elicit the data required, (Colbert, 2001; Grinter & Eldridge, 2003; Sellen & Harper, 1997). In the context of the research undertaken within this work, aspects of interest related to the video content consumed, location and social situation. Returned diary data would then represent a quantitative data source, with the information affording comparative analysis. Where applicable coded diary data can be presented using descriptive statistical methods and indicative findings used as avenues into analysis of complementary qualitative data.

One of the concerns with using diaries is sustaining participant involvement over the course of the study (Carter & Mankoff, 2005). Filling in paper diaries also distracts the user from the activity at hand. Such issues increase the possibility of participants dropping out of studies due to the effort involved. Additionally, validity issues are raised due to the increased chances of behaviours being under reported or fictitious information created (Mitchell, 2005).

To overcome some of the concerns with traditional diary methods, media capture has become another means of documenting records of use. Examples include video taping TV use over sustained periods of time (Schmitt, Woolf, & Anderson, 2003), asking users to leave voice mail recordings documenting their use of mobile phones (Palen, Salzman, & Youngs, 2000), asking participants to text message snippets of diary information to researchers (Sohn, Li, Griswold, & Hollan, 2008), asking users to create a photo log of their behaviours by taking pictures (Brown, Sellen, & O'Hara, 2000; Carter & Mankoff, 2005), asking users to collect physical artefacts from their environments of use (Carter & Mankoff, 2005) and asking users to capture screen shots of their mobile usage to investigate task Flow (Karlson et al., 2010). Researchers using these methods argue they are lower effort than completing paper diaries and provided richer data (Palen et al., 2000). As these methods also capture physical evidence, they reduce the likelihood of fictitious reporting and also provide data with some empirical value (Carter & Mankoff, 2005).

However in many cases asking users to collect media reverts the diary method to a study of specific events rather than a record of use. Additionally, social pressures within situations can often make it difficult to capture media first hand all the time. Therefore media capture in the diary method usually serves as cues for the participant to recall specific episodes of use in post study interview (Barsalou, 1988) rather than as records of use in their own right. A further complication to capturing media in the diary method is that usually data capture relies on a specific device. In highly mobile studies this can be an issue. Technology is not always that mobile, and even if it is, carrying an unfamiliar device around might be alien for a user, or an easy thing for them to forget to carry when tasked to do so all the time.

Therefore, although paper dairies present some methodological challenges, they represent a device agnostic and relatively low effort method for capturing detailed records of use. Promoting engagement in data reporting can be sustained through the study period by frequent contact, periodic reminders and well-designed incentives (Palen & Salzman, 2002). A typical strategy would be to telephone, email or visit participants to enquire about their data collection progress part way through diary periods as way of a motivational prompt. Staged incentive payments, (so participants don't received all of their payment until the diary data has been returned and reviewed) can also help.

Mitchell (2005) notes diary use as a method is particularly well suited to studies with a mobile component. Diary has also been used as a complementary method in a number of past relevant studies such as Vorbau, Mitchell and O'Hara (2007) and O'Hara et al. (2007) which both investigated mobile video consumption.

Collection of such information in the context of this research allows an indicative analysis of the prevalence of particular viewing situations that may be further analysed through richer qualitative methods.

3.4 Measuring experiences.

Whilst the methodologies addressed so far have focused on capturing the contexts of viewing and associated user behaviour, methods were also required through which to evaluate the quality of the experiences attained. This was a methodological aspect of key importance to the research. Viewing experiences needed to be measured and compared in order to discriminate positive experiences from negative ones, each categorisation of experience could then be explored to identify the factors that contributed to those outcomes.

Whilst much discussion in the literature has focused on definitions for UX there is only limited agreement in what factors actually contribute to its creation (see Chapter 2, Table 2.1). Therefore UX is a difficult concept to operationalize and measure (Obrist et al., 2010). The need within the research to measure and compare experiences suggested a quantitative approach should be pursued. Additionally, if we take the methodological position that experience is created in the minds of the user and based on internal perceptions and emotional judgements (as the author has previously argued in Chapter 2), methods were needed which solicited responses directly from that user. Whilst this may therefore suggest a subjective approach, objective measures have also been applied to the measurement of our inner psychological processes.

3.4.1 Physiological measures

Objective measures focus on capturing outwardly detectable human reactions to experimental situations. Most studies in this arena relate to the measurement of specific physiological factors as an indicator of inner psychological processes (psychophysiology). This approach has been used in the past by human factors researchers and psychologists as indicators to infer aspects such as mental load and emotion, (Wilson, 2002; Ekman, Levenson, & Friesen, 1983). More recently the measurement of physiological factors has been applied to the measurement of components of UX. Mandryk, Atkins and Inkpen (2006) used electrocardiograms (ECG) and skin response to investigate emotional episodes such as frustration and excitement during video gaming. However the authors reported a number of problems in controlling the variation in influencing factors outside those being investigated.

Brain activity has also been explored to understand inner psychological processes related to experience. Alpha band brain wave length attenuation has been studied using electroencephalography (EEG). Pellouchoud, Smith, McEvoy and Gevins (1999) found higher levels of activation in frontal and central brain regions when people actively engaged in playing a video game, compared to those who passively watched the same experience. Smith and

Gevins (2004) evaluated attention in relation to watching TV commercials. They found correlations between attenuation of components of the alpha trace and user's attention to video as measured through complementary methods. This led them to conclude giving attention to video is a key component of user viewing engagement. However they reported a time lag between the video events and related brain activity, proposing that the exact moment in time that an event occurs on the screen may not be when thoughts related to that event also occur. Smith and Gevins (2004, p. 289) therefore concede that:

> *"…related mental musings are undoubtedly both variable and not directly knowable."*

Bakalash and Riemer (2014) used functional magnetic resonance imaging (fMRI) to attempt to measure emotional responses to television advertising. There study had a focus on the relationship between the level of emotional response (arousal) and memorability of the ad. Whilst this study found a link between the levels of arousal as measured from the fMRI and how well participants remembered adverts after the seeing them, the scanning technique could not discriminate valance, (the feelings of positive or negative affect towards the advert). This element needed to be elicited from participants separately, using a survey scale tool. So whilst the fMRI could identify the level of emotional impact if couldn't tell if that impact was positive or negative.

All of these studies highlight a general issue with physiological measures, that they are inconsistent and prone to variation across subjects (Ravaja, 2004). A further issue applying to lab-based evaluations is the artificial nature of the situations of use. As discussed earlier in this chapter, in context study has become a major research focus within HCI disciplines (Obrist et al., 2009). The complex and interconnected relationships between experience and context are influenced by social, technological, spatial and temporal factors (Venkatesh, 2006). As such it can be argued that experience cannot be evaluated in isolation from context (Bernhaupt et al., 2008). Benyon, Turner and Turner (2005) encourage researchers to configure the situations they evaluate within to be as close as possible to the real context of use. However rather than attempting to replicate the world, Fields, Amaldi, Wong and Gill (2007) advocate a better solution is to conduct research in the context where the activity actually takes place.

3.4.2 Survey tools

A key consistency in the studies noted in the last section was the use of complementary survey scale tools to elicit responses directly from the participants. A survey is a subjective self-reported method. Such tools have been extensively used within human factors research due to the fact that they are not only self-reported but also highly transferable to different contexts of use. This makes them highly compatible with many of the commonly understood characteristics of UX as a subjective, dynamic and context-dependent construct (Law & van Schaik, 2010).

The most mature scale tools relate to usability. Questionnaire tools such as Measuring Usability in Context - MUSiC (Bevan, 1995), the System Usability Scale – SUS (Brooke, 1996) and the Software Usability Measurement Inventory - SUMI (Kirakowski & Corbett, 1993) are well understood and frequently used in both academia and industry. Whilst these survey tools are useful within their own context, the focus on usability is one-dimensional. A system can be useful and efficient, but at the same time displeasurable to use due to other aspects (Chin, Diehl, & Norman, 1988). Usability is only a single component of experience and so evaluating UX requires measurement boundaries to be extended (Vermeeren et al., 2010).

Emotion and Satisfaction

A critical factor to consider in measuring experience is that the user's satisfaction with the outcome is captured. It is likely (and desirable in terms of gaining a better understanding of viewing context) that any tool for quantifying experience provides different responses from users who watch under different conditions. Therefore a component of measurement needed to capture satisfaction. Only then could design decisions be made with any confidence that they will improve the user's perception of the experience.

Satisfaction as a facet of user experience is regarded as a subjective emotional response. Much work has been done in the field of psychology to better understand our emotional responses, and this has relevance to measuring satisfaction. Lindgaard and Dudek (2003) suggest our experiences with products are likely to involve an affective component, and this influences the levels of what we regard as user satisfaction. The psychological construct of Affect is described as the experience of feeling (Hogg, Abrams, & Martin, 2010). Affect is perceived as the involuntarily emotional responses that accompany our judgements of objective properties (Zajonc, 1980). Affective states as described in Harmon-Jones, Gable and Price (2013, p. 2) consist of three elements:

- Valence. The subjective positive to negative evaluation of the current state.

- Arousal. Engendered through activation of the sympathetic nervous system.

- Motivational Intensity. The intensity of the emotional feeling in terms of wanting to move to or away from a stimulus.

Mehrabian and Russell (1974) developed the pleasure, arousal, dominance scale (PAD) which measures affect as a multifaceted emotional response through self reported levels of happiness, excitement and feelings of control. The PAD scale has been used successfully within HCI as a UX evaluation tool. (Agarwal & Meyer, 2009).

An evolution of the PAD is the Self Assessment Manikin -SAM (Lang, 1985). This scale again is based on measuring the three elements of PAD and uses a 9-point likert scale. Each of the three scales are tied to standardised graphics used to represent varying levels of emotional response. Valence is measured using a scale for pleasure (Havlena & Holbrook, 1986). This uses facial representations running from frowning to a wide smile. Lombard et al. (2000) used a narrower five-point SAM scale in their related study on presence and television (see Figure 3.1). The SAM scales have been shown to be both highly reliable and highly correlated with traditional measures of emotional response and physiological activity (Lang, Greenwald, Bradley, & Hamm, 1993).

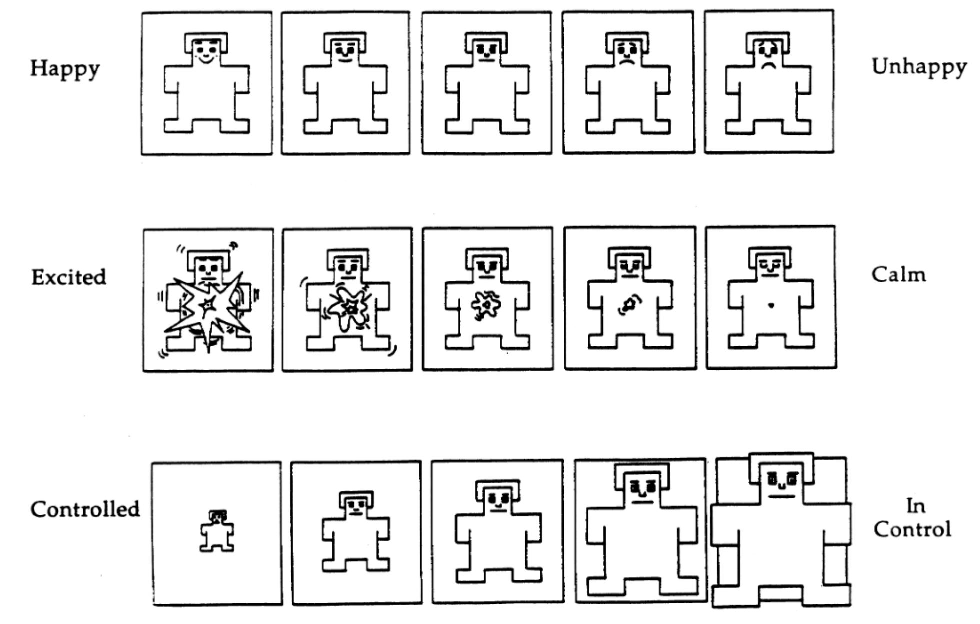


Figure 3.1. The SAM scale (valence, arousal, and dominance). Taken from Lombard et al. (2000, p. 85).

In other studies, the valence scale from the SAM has been used in isolation from the other elements as a low effort and reliable single scale tool through which to capture self reported feedback on a participant's perceptions of if they are feeling positive or negative emotion. These tools are typically used during or at the end of an interaction to capture how satisfied a participant feels at that particular moment. As with the SAM they use pictograms of facial expressions to depict the scale (Benedek & Miner, 2002; Read, MacFarlane, & Casey, 2002). More recently Obrist et al. (2009) used this same approach as a complimentary data collection method when evaluating iTV concepts during a field trial.

Multi dimensional tools

Independent from the Psychological literature, HCI has also developed tools to address the measurement of satisfaction. These originated from an understanding that there was more to user interaction than only usability. Early scales represent the first attempts to measure beyond the instrumental aspects of task success and efficiency towards experiential elements such as attractiveness, pleasure and control. Examples include the Questionnaire for User Interface Satisfaction –QUIS (Chin et al., 1988), Website Analysis and Measurement Inventory -WAMMI (Kirakowski, Claridge, & Whitehand, 1998) and AttrakDiff scales (Hassenzahl, Burmester, & Koller, 2003).

In deploying and analysing studies using these tools researchers soon discounted the concept of satisfaction as a uni-dimensional concept (Lindgaard & Dudek, 2003) and instead focused on experience as a complex, multifaceted and nuanced entity which influences and informs our feeling of positive perception.

In the literature discussions in Chapter 2, a number of frameworks through which to characterise experience were discussed. The frameworks are multifaceted in nature and provide the opportunity to operationalize the concepts described through the development of multi-dimensional measurement tools. Measuring concepts discussed in the literature (such as Flow) could offer a rich source of information regarding UX. Novak and Hoffman (1997, p. 5) describe three general methods through which attempts have been made to measure Flow:

- Narrative and survey (Privette & Bundrick, 1987). The user provides a narrative description of a past flow experience and then is asked to evaluate it using a survey tool.

- Activity and survey (Webster, Trevino, & Ryan, 1993). The user takes part in an activity and is then asked afterwards to evaluate that experience using a survey tool.

- The Experience sampling method (Csikszentmihalyi & Csikszentmihalyi, 1988). The user is contacted at random times through the study period and asked to evaluate their current activity at that point in time using a survey tool.

Webster et al's. (1993) survey tool takes a multi-dimensional approach, addressing aspects reported to represent Flow, (such as feeling of control, attention focus and curiosity). However Novak and Hoffman suggest both activity rating and narrative recounting approaches are compromised by collecting data about Flow after events happen. It is an open question if participants can reliably evaluate Flow after, rather than during the event. Thomas and Diener (1990) found people were poor at accurately recounting their emotions from events that happened in the past. This is particularly an issue for the narrative approach as the experiences could have occurred sometime ago.

Csikszentmihalyi et al. (1988) attempts to overcome the issue of post hoc data collection by using the Experience Sampling Method (ESM). This is a method using a questionnaire sampling tool which through the use of alerts provided by a stop watch, telephone, pager or other similar method, prompts users to provide feedback on emotions and experiences at given moments of time, including during the midst of experiences of interest. The aim of using the ESM method is to be objective about subjective phenomenon (Csikszentmihalyi & Larson, 1987). At the core of ESM is the key concern of reporting experiences as they are experienced, rather than after the event when feelings engendered by the situation have faded into memory. The original ESM method uses a two-page questionnaire that measures the extent to which the user is experiencing Flow at that moment in time.

The ESM has been used frequently to measure user's subjective responses in response to product use. This is particularly true in mobile environments where portability, and the self reported data approach makes it suitable (Intille, Rondoni, Kukla, Iacono, & Bao, 2003; Froehlich, Chen, Consolvo, Harrison, &

Landay, 2007). ESM has also been used specifically to investigate mobile TV (Obrist et al., 2010). One of the major disadvantages of the ESM in terms of user experience analysis is that it disrupts the user from their activities and forces them to answer questions. This is a significant issue if the goal is to evaluate the experience outcome and not simply capture the mood of the user at a point in time. Intille et al. (2003) acknowledges this issue and proposes using the ESM method to collect data in different (and less obtrusive ways). Suggested examples include capturing photos and video clips rather than administering the ESM questionnaire. However this removes the measurement aspect from the method and leaves it purely as a data sampling technique.

Measuring Flow (through any approach) may not be suitable for quantifying all types of user experience. As previously discussed in Chapter 2, many types of experience (including most video consumption scenarios) are not particularly interactive. Therefore measuring Flow, which stresses control and interactivity, as core to the creation of experience may not in fact represent a suitable metric.

Engagement

Alternative efforts have also been made to instead measure experience by using the construct of engagement. Based on the discussions in Chapter 2, Section 2.2.2 the author feels engagement may offer a more suitable construct through which to measure passive viewing consumption experiences rather than Flow.

There have been a number of different approaches to the measurement of engagement. Many have been based on evolution of the Flow paradigms to adjust for differences in interaction within the specific contexts under investigation. Interactive learning and presentation has particularly been an area of development for the concept of measuring engagement. Webster and Ho (1997) defined a survey scale based on measuring aspects of engagement in relation to the impact of multimedia presentation in learning. They defined engagement as similar to a state of playfulness. They identified four aspects as key to improving viewer engagement; challenge, presenter control, content variety and feedback. Critically, these aspects still relate to interaction and therefore do not fit well to explaining passive experiences. O'Brien and Toms (2008) build on that scale, drawing together the threads of multiple methodological frameworks for user experience in the literature to identify some core attributes that constituted engaging experience. This work subsequently evolved into the development of the self-reported User Engagement Scale (UES) (O'Brien & Toms 2010a). The method uses a multi-dimensional scale and addresses six key areas they previously identified as influencing user engagement (O'Brien, Toms, Kelloway, & Kelley, 2008):

- Perceived Usability. The emotions and perceived effort users feel when engaged in the experience.
- Aesthetics. The users overall aesthetic impressions of the attractiveness and sensory appeal of the experience.
- Focused Attention. The user's ability to become absorbed and to lose themselves in the experience. This is signified by the loss of time perception and reduced awareness of events taking place outside of the experience.
- Felt Involvement. The user's perceptions of being drawn into an experience because it is fun, important or relevant.
- Novelty. The user's perceptions of the experience as evoking curiosity and interest.
- Endurability. The user's perception of whether the experience was successful, rewarding and worthwhile.

This method for qualifying engagement is appealing on a number of fronts. It measures high-level constructs that are informed and coincide with many of the factors reported in the literature related to theories of user experience. Critically the construct can also cope with passive experience due to their model of engagement, disengagement and reengagement, (see Chapter 2, Figure 2.6). O'Brien and Toms (2010a) showed relationships between three categories of the scale and emotional Affect. This should ensure ratings on the User Engagement Scale correlate to valence and thus have a relationship to user satisfaction. The factors are also reported as having some measure of interrelation, rather than being independent. This is a quality in agreement with theories of user experience, that UX is a complex combination of interrelated factors (see Chapter 2,Table 2.1).

Evolution of the UES in the literature between 2010 and 2013.

At the time of writing, the UES tool had been analysed for both internal consistency and reliability through large scale user studies (O'Brien & Toms, 2010a). Another benefit of this scale included its authors advocating the tool's portability for use in other domains (O'Brien & Toms, 2010b). However an important point to note was that as of the end of 2010, it had yet to be used to evaluate TV or video consumption experiences. Therefore there were still open questions around the reliability of the UES as a multidimensional tool when applied to different measurement contexts.

Further follow on studies (Banhawi & Mohamad, 2011; O'Brien & Toms, 2013) investigated the generalizability of the scale were published after the main data collection for this study took place in 2010. These showed that when applied to two further domains, (Facebook and interactive information retrieval) the 6 factors that composed the UES were not independent. This could be expected from O'Brien and Toms' earlier work that showed some factors were interrelated (O'Brien & Toms, 2010a). However in each study the pattern of loading of factors across subscale items was significantly different. This indicated that sub scale items were not internally consistent and suggested revision was needed to the UES.

The follow on studies provide added context to the findings of the use of the UES within this research. As part of the research studies in Study 2.1, the UES was administered to users and then an evaluation of the scale made as a multidimensional tool. This investigation can be reviewed in Chapter 5, Section 5.5.2.

Summary of methods use

Within this chapter a range of methods and methodological issues have been discussed in relation to how best to meet the research aims. Whilst conducting the research documented in this thesis many of the methods discussed were utilised. To assist the reader, method use across the research has been documented in Table 3.1. This summarizes the literature references to the method approach (where not original). Sign posting is also provided to the study design sections of each chapter. Here the reader can locate further methodological discussion in regards to specific protocol setups within individual studies.

Study	Methods	References	Study Design Method
Study 1. Understanding Contextual Cues (Chapter 4)	• Diary • Semi Standardised Interview • Ethnography • Participant Captured Video Collection (Vivitar handheld)	Carroll et al. (2002) Berg (2006) Stoddart (1986)	Chapter 4, Section 4.3.
Study 2, part 1. Measuring Viewing Experience in Context (Chapter 5)	• UES Questionnaire • Satisfaction Scale	O'Brien & Toms. (2010b) Read et al. (2002).	Chapter 5, Section 5.3.
Study 2, part 2. Characterising video consumption. (Chapter 6)	• Group Interview • Participant Captured Video Collection (Muvi wearable) • Systematic Observation and analysis	Berg (2006) Bakeman et al. (2005)	Chapter 6, Section 6.3.

Table 3.1. Summary of methods used during the research.

3.5 The ethical considerations of running the research

Researchers have a responsibility to ensure participants involved in research are not harmed and that their privacy is maintained. Individuals also need to be fully informed of the nature of the research they take part in, the data being captured and how that information will be used. Researchers need to obtain informed consent, and finally participants must retain the right to remove themselves from the study at any point.

Running qualitative research in possibly private contexts raised particularly important ethical considerations in relation to both the participant and researcher's personal safety. In addition, capturing data such as video in private contexts raised issues over maintaining user privacy. This was especially true in relation to how that data may to presented or disseminated in the future. To address these issues a number of general protocols were put in place that covered all aspects of the research conducted.

Personal safety of the participant and the researcher

No one under the age of eighteen was recruited for any of the studies conducted within the research. The locations for all research observation conducted outside of private environments were selected in agreement with the participant and carried out in public areas and at times of day when they were well frequented. Observation in private environments required the presence of at least one participant chaperone on the premises, (usually a family member) and the researcher's schedule, location and contact details were left with a fellow researcher during visits. Participants issued with recording equipment were warned during entry interviews and through study documentation of the importance of personal safety and staying safe when using the equipment in public.

Informed consent and right to withdraw

Signed consent was obtained from all participants who took part in the research. The consent forms laid out the study detail and rights to withdraw. These factors were re-enforced verbally during entry interviews at the start of all research.

Privacy

Participants were informed both on the consent form and verbally during entry interviews as to what data would be captured and how it would be used. Where participants self captured video data they were invited to freely review it on the device during the study period and delete any data they were not comfortable sharing before returning the device. When making recordings, participants were also asked to respect the privacy to others who they may also capture in the environment. This was of particular importance in private environments and so participants were instructed to make clear their intent to video the experience to anyone else present in such environments before beginning to film.

Confidentiality

All data once collected at source was anonymised. All user data that was stored (including the video data and analysis), was held within password-protected files and was not shared. Personal information was held in line with data protection good practice with participant information being deleted as soon as it was no longer needed. The data collected has not been used for any other purpose than that disclosed in the consent form at the time of the research.

Use of images and data

Consent to use images and data derived from the study within academic publications was obtained in the consent form prior to research taking place. The researcher has been sensitive to user privacy and confidentiality when considering images and information to disclose in publication submissions.

4 Study 1. Understanding Contextual Cues

4.1 Introduction

Characterising the contexts of video consumption offers the possibility to improve the interpretation of context within adaptive systems and therefore end user experiences. As discussed in the review of related work (see section 2.3) information regarding user behaviour in different situations has long been investigated as an approach towards understanding context. There are clear benefits to consideration of the user's situation, as even low complexity systems still demonstrate successful results when used under real world conditions (Konston, 2001), and reasoning systems have been enhanced through the addition of models of contextual user activity, (Partridge & Price, 2009).

From the social sciences there is a wealth of ethnographic insight aimed at capturing the nature of situated product interaction (Taylor & Harper, 2002; Tamminen et al., 2004; Ito, 2006). There is additionally a rich body of similar insight specifically addressing video consumption (O'Brien & Rodden, 1997; Taylor & Harper, 2003; Bernhaupt et al., 2008; Saxbe et al., 2011). However despite our growing knowledge regarding situated use, the technical solutions tackling context pay only passing regard for user insight within their models (Karatzoglou et al., 2010; Vargas-Govea et al., 2011; Baltrunas et al., 2012). This by definition means they cannot be representative of real user behaviours or aligned to user need. To restate the aim of the research from chapter one, the goal is to provide a user centric model for the interpretation of viewing context. With an understanding of the impact aspects of context can have on a user's viewing experience, a future system could then make contextually sensitive adaptions to provide the best user experience.

Achieving this goal not only requires a user centric understanding of viewing context. The gulf between qualitative user insight and technical implementation also needs to be closed through a translation of insight into a definitive model for viewing context. This would not only aid technical implementation but also deliver traceability back to truly user centred insight and research.

The concepts of situatedness by Rohlfing et al. (2003) and re-place-ing space (Harrison & Dourish, 1996) demonstrate that higher level notions of context, manifest as perceived situation can provide a general approach to formalising the concept of viewing context. In the author's definition of context (see 2.3.6) the argument is put forward that perceived situation is created in the mind of the user, it can equally be described that situation is a semantic interpretation of the external context (Dobson & Ye, 2006). Therefore all internalised notions of situation are formed by lower level contextual cues present in the environment (Bettini, et al., 2010).

Rather than attempting to consider all variables in an environment, we can instead follow an approach to identify those context cues that create the shared reality and therefore perceived situation in the minds of the user, the inter-context. For it is through situation that consumption experiences are characterised. Rather than a focus on physical context, user centric contextual investigations should relate to perceived context and the meaningful inter-contextual cues manifest within them.

4.2 Study Aims

The hypothesis under consideration was that inter-contextual cues within a consumption context impact greatly upon the notion of perceived situation from the perspective of the end user. This study attempted to identify components of context seen within typical viewing scenarios and characterise the relationships between their presence and the formation of viewing situation. This was from the perspective of both the user's expectations and actual behaviours.

Objectives of study one:

- Identification and verification of inter-contextual cues present within video consumption situations of use.

- Identification of the modifications to consumption behaviour users make in response to specific inter-contextual cues.
- Identification of the most common situations of consumption in order to focus further studies into viewing experience later in the project.

Gathered understanding within these areas would firstly provide a model for viewing situation through which to consider the UX (and related applicable adaptations). There is a need for a better understanding of the context of use in order to steer the development of TV services and content (Obrist et al., 2010). Secondly it will identify the inter-contextual cues that characterise episodes of situated viewing. It is only through entering the user's context that we can identify the interaction adaptions and accommodations a user makes in response to their context (Esbjörnsson, Juhlin, & Weilenmann, 2007). This information could then in turn be used within a contextual framework (and models for context in future technical systems) to both identify and describe viewing contexts. Finally it provides a platform for future studies through which to consider the video consumption UX in more depth and particularly the underlying design qualities required to support UX within specific viewing situations.

4.3 Method

Delivery of the study aims required a research approach spanning the following activities:

- The identification of candidate viewing contexts to investigate within the study.
- Methods through which to collect data on aspects of the viewing contexts in order to identify and verify the existence of relevant inter-contextual cues within them.
- Methods through which to collect data on the activities and motivations of the user when within those contexts to understand the relevance of inter-contextual cues to the creation of situation.

4.3.1 Study Design Considerations

Method Selection

A mixed methods approach (Greene, 2007) was used within the study in order to capture externally observable information, and elicit insights from users. The study included observation, interview and diary methods. Each participant was interviewed twice. The aim was to accumulate authentic insights into people's experiences (Silverman, 2001) over a period of time (Taylor & Harper, 2002).

In order to capture externally observable cues a range of observation methods were considered. These included direct observation by the researcher and self-captured video by the participants themselves. These methods were trialled at the start of data collection during a short pilot. This is discussed in detail within the results section.

Selection of contextual situations

The first activity of study one was to identify valid instances of situated video consumption. Contexts to investigate within the data collection could then be drawn from these. During any research the investigator must justify a rationale for using a particular setting for data-collection (Marshall & Rossman, 2010). Prior to conducting original research the most valid source for the identification of context is the existing literature, which may describe observed user behaviours and consumption settings. An analysis of the prior literature aimed at identifying examples of situated video consumption was therefore the starting point for the study.

As previously covered in the review of related work (see Chapter 2) there have been many field studies investigating situated use of electronic devices including televisions, mobile devices, personal computers and others. Papers in this area therefore form a rich source for the identification of specific examples of situated viewing consumption. An analysis of the literature was undertaken to develop an open coded list of factors based on identifying elements from the accounts and follow on discussion in the papers. This exercise identified 244 contextual elements. An affinity diagramming process (Holtzblatt & Jones, 1993) was then carried out to categorise the elements into logical groupings. In some cases where it was sensible to do so contextual elements were grouped under 2 or more headings. This process initially identified 25 contextual criteria, which through further closed categorisation under five context areas as proposed by Jumisko-Pyykkö et al. (2010) were reduced to 13 preliminary inter-context cues. This was achieved through combining of elements where duplication existed. An example of this full process for one of the criteria '*Experience is shared with other people'* is documented in Figure 4.1. The 13 preliminary cues from the exercise as a total are presented in Table 4.1.

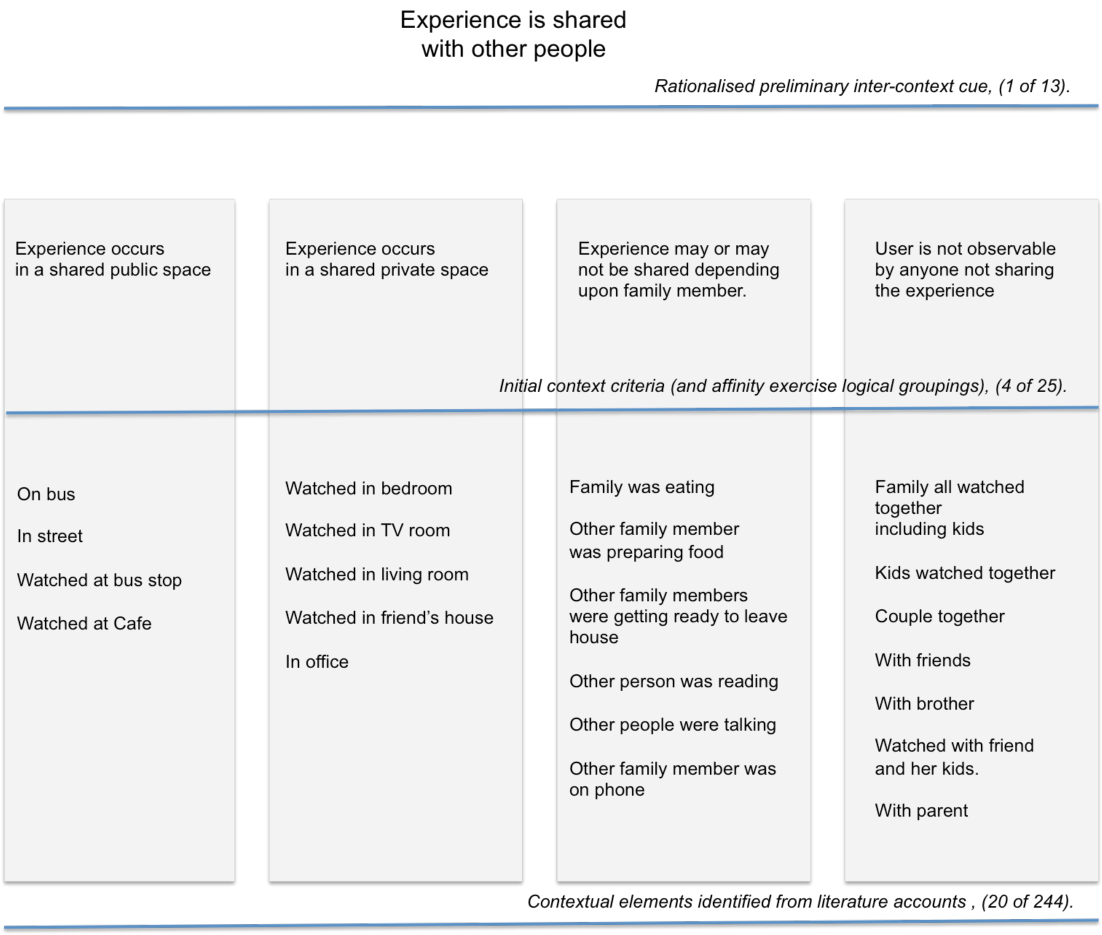


Figure 4.1. The process of creating preliminary inter-contextual cues.

From the initial literature review it could not be verified whether any of the preliminary inter-contextual criteria played a role in the building of perceived context for the user. Only that they were commonly shared outwardly observable features of the situation which allowed similar situations in the literature to be grouped. It was therefore a significant aim of the data collection component of the study to verify the validity and impact of preliminary criteria upon perceived context.

Preliminary identification of inter-contextual criteria.
1. Social context (*presence, inter-personal interaction, culture)*.
User experience is solitary Experience is shared with other people Type of relationship user shares with other people
2. Physical context *(location, privacy, mobility).*
Experience location is a private space Experience location is a public space User is observable by people not sharing the experience
3. Temporal Context *(duration, absolute time, synchronisation).*
Duration of the consumption experience Reported time of day of the consumption experience User control over the length of the experience
4. Technical Context. *(device usage, access to systems and services).*
Generic device type utilised for consumption Reported access to content
5. Task Context. *(multi-tasking, interruption).*
User is described as dealing with interruption User is described as dealing with a parallel task

Table 4.1. Preliminary inter-contextual criteria used for situation formation.

Accounts in the literature were then re-analysed to identify consistently shared contextual aspects at the level of contextual criteria (the affinity exercise logical groupings level). The benefit of conducting the review against these criteria was that it allowed differing viewing examples (in terms of the physical location or devices used) to more easily be identified as similar situations due to commonly shared contextual criteria. When examples of similar criteria were identified across multiple viewing examples, those scenarios were grouped and "Archetype" descriptive names assigned to the situation type. As classified by Berg (2006), a topology of situations based on all the examples discovered within the literature was then created. This activity identified seven Archetype situations that are summarised in Table 4.2. Full descriptions of the Archetypes and the related context criteria can be found in Appendix A, Section 10.1.

The focus of this exercise was not to identify all conceivable consumption situations, but rather to build a list of prospective avenues for original field research based upon verifiable accounts of use. Clearly the literature no matter how comprehensive is not exhaustive. Because of this fact a number of valid situations of consumption may have been excluded from the exercise due to lack of prior evidence in the literature. Two areas lacking from the review were the use of video in educational contexts and also within public address systems, there are possibly others. However it is important to stress that the purpose of this exercise was to identify a set of contexts for investigation not only validated through the literature, but also with enough applicability to populist forms of content consumption to provide improvements to wider macro viewing experiences. Therefore whilst the list is by no means exhaustive, it did provide a representative snapshot of the majority of consumption situations and thus offers a useful basis for further study.

Situation / Archetype	Identified in the literature from:
1. Individuals creating privacy in public places	O'Hara et al. (2007) Tamminen et al. (2004) Södergård (2003) Vorbau, Mitchell and O'Hara (2007) Repo, Hyvonen, Pantzar and Timonen (2004) Miyauchi et al. (2009)
2. Opportunist planning of content consumption.	Perry et al. (2001) O'Hara et al. (2007) Chipchase et al. (2006)
3. Sharing space but not content.	O'Hara et al. (2007) Taylor and Harper (2003) Vorbau et al. (2007) CRE (2010a)
4. Quality Time	Brown and Barkhuus (2006) Taylor and Harper (2003) O'Brien et al. (1999) CRE (2010b)
5. Family viewing	Taylor and Harper (2003) O'Brien and Rodden (1997) Saxbe et al. (2011)
6. Creating private group spaces in public places.	O'Hara et al. (2007) Tamminen et al. (2004) Vorbau et al. (2007) Repo et al. (2004) Chipchase et al. (2006)
7. Content schedules as timekeeper.	O'Brien and Rodden (1997) O'Brien et al. (1999)

Table 4.2. Topology of identified Archetypes of situated use.

Archetypes selected for further study

Due to finite resource constraints it was not feasible to investigate within a field study every Archetype viewing situation identified from the literature. It was therefore the author's intention to investigate a subset of situations that provided the most useful insights in regards to the aims of the study. There were a number of both academic and pragmatic criteria to consider within the Archetype selection process to ensure the study met the goals of the research. These are summarised below. Discussion justifying selection criteria is documented in Appendix A, Section 10.1.8.

- Diversity in contextual criteria between selected Archetypes.
- Representative of the majority of viewing.
- Maximised applicability to real world design.
- Situations accessible to study.
- Clear user benefits in providing analysis.

After consideration, three Archetype viewing situations were selected from the topology for inclusion within the main study, (see Table 4.3). These Archetypes met the requirements for selection outlined above. As a whole, they represented diversity in the inter-contextual cues identified, but by covering viewing both in the home and in mobile contexts they were also representative of the majority of contexts of use. Each exhibited nuanced differences in their social, physical, temporal, technical and task contexts. It was hoped a deeper analysis of these Archetypes would allow the discovery and investigation to contextual elements with significant influence over the user experience, and therefore be of specific interest for technical system designers.

Situation / Archetype	Definition
2. Opportunist planning of content consumption.	Individuals who loosely plan to consume video out in public situations. Rather than making specific plans they instead just make sure content is available to consume on their device whenever they find themselves out in public with opportunity to watch.
3. Sharing space but not content.	Situations in the home when family groups share the same physical space but engage in different media consumption activities. As example one user reading or surfing whilst the others watch TV.
4. Quality Time	A period of time in the evening, usually after younger children have gone to bed. Adults report this as their most engaged shared viewing, usually in front of the living room TV.

Table 4.3. Archetypes selected for study.

4.3.2 Participants

Sample size considerations

The total study process lasted three weeks for each participant. This combined with an inability to run more than three participants in parallel due to a limited number of video cameras (used for capturing observations) made the number of participants recruited an important consideration. The sample needed to be representative and diverse enough to provide a rich qualitative source of insight, but too many participants would extend the data collection period over a number of months and offer diminishing benefits in terms of original insight. A sample size of twelve users was therefore selected. Based on a three-week study process, this represented twelve weeks of fieldwork in total.

Participant recruitment, screening and retention

Except for the observation methods trial sample (whom were drawn from friends and family), participants were recruited through local community online bulletin boards and classified ads. Reasons behind this sampling strategy related to a decision to trial direct observation as one of the methods. In order to overcome experimenter effects and collect natural behaviours, the researcher therefore needed to employ a strategy in which they themselves could become invisible to the participants during the observation sessions. This was achieved by personalising the ethnographer - participant relationship (Stoddart, 1986).

Before induction into the study, participants were screened through the use of a questionnaire to ascertain they engaged in viewing behaviours relevant to the Archetype situations. This process maximised the possibilities to capture insight in the areas of interest.

Despite the use of standard retention techniques, (including weekly email reminders to participants) retention of users during the early stages of the study proved difficult. Four screened participants did not reply to requests to arrange the first meeting, whilst a further two who started data collection pulled out during the first week. This extended the data collection as replacement users had to be found. Only one further participant could be recruited in the timeframe once data collection had started, so the total sample was reduced to 11 people.

The recruited sample

Table 4.4 offers a high level summary of the demographics for the participants recruited for the study. The observation methods trial study sample was a subset of three users from the main sample of eleven. Ages ranged from 24 to 32 *(M=28, SD=4)* and consisted of two males and one female. They all lived in homes shared with family, watched video outside the home and had access to a video capable mobile device. Two of the three users also reported regularly watching content from the Internet.

Total sample size.	11
Age.	24 to 47 *(M=31, SD=7.2)*
Sex.	7-Male 4-Female
Living in households with others.	9
Watch video from the internet.	7
Watch video outside the home.	7
Owns a video capable mobile device (phone / media-player / laptop).	11

Table 4.4. Participant demographics.

4.3.3 Procedure

The first interview occurred during an initial kick off meeting. This interview focused on uncovering the user's general behaviours surrounding video content consumption. The second interview took place during the exit meeting approximately a week after the end of a two-week data collection period. This interview was highly contextualised to each specific user. The interview provided further detail regarding situations either identified from observation or highlighted from diary data. Both interviews used a semi-structured approach conforming to the format described in Berg (2006). Interviews were recorded using a digital voice recorder before being transcribed verbatim.

Direct observation data was captured of specific viewing contexts during the observation method trial sessions. Visits were arranged to both public and private consumption situations where the researcher observed viewing situations by prior agreement with the participants in order to gather data. A shadowing protocol was employed. Additionally participants captured self-reported video data of the viewing context. This was achieved using a small mobile camcorder (Vivitar DVR 565HD) issued to the participant during the entry interview. Although this reduced the control over data capture and was therefore susceptible to validity issues (Mark et al., 2001), it reduced experimenter effects

(Rosenthal, 1976) and the logistical and ethical issues surrounding data capture in the environments of interest to the study.

All participants additionally kept a paper diary. The procedure followed the general approach to a diary method used by Carroll et al. (2002). Participants were given a booklet to keep a record of all the video content they consumed during the two week study period. The diary attempted to capture the following information for each viewing instance: time and date; content title; broadcaster / source; duration; watched with; device watched on; location or situation; and any other comments. Table 4.5 outlines the high level processes employed to execute the study as a whole. General protocols for the research methods described follow those laid out in the method discussions in Chapter 3.

The data collection period was estimated to run for a total duration of twelve weeks. This timing was based on initially running three users through the observation methods trial before completing the study with the remaining eight participants. This timing does not account for analysis or changes to the data collection strategy post the observation methods trial.

Data analysis consisted of the diary sessions being used to identify situation Archetypes based on the presence of preliminary inter-contextual cues. Where parallel observation or video data existed for those sessions a closed coding against the inter-contextual cues was carried out to confirm the situation Archetype.

The observation and video data was then analysed for a second time using an inductive open coding to identify any other aspects of context present within the situation Archetypes. This analysis was used to confirm, reject or augment the preliminary intercontextual cues and also to build rich qualitative descriptions and themes around the viewing situations captured and user behaviours observed. Further details of the analysis method can be viewed in Appendix D, Section 10.4.

Activity	Description
Identification and selection of consumption situations to investigate.	Identified from the literature. Formulation of situation topology and preliminary inter-contextual cues.
Recruitment of participants.	Screening based on reported consumption behaviours relevant to the Archetypes. Captured demographics.
Participant entry interview.	Semi structured interview to gather data on users reported behaviours. Content preferences and viewing adaptation information captured. Further study activities introduced
Direct observation data collection.	Visits to both public and private consumption situations as agreed with participants to gather contextual data.
Self reported video observation data collection.	Users capture own instances of video consumption in a range of situations using a video camera.
Diary Study	Users kept a diary of the content they consumed over the course of the study.
Data analysis	Archetypes identified from the diary sessions using preliminary inter-contextual cues. Parallel observation and video data used to confirm the Archetype using a closed coding against the cues. An inductive open coding of the observation and video data used to identify other aspects of context present and to verify, reject or augment the preliminary intercontext cues. Rich descriptions of the situations captured.
Participant exit interview	Semi-structured interview to gather richer insights regarding the inner motivations and goals of the participants related to Archetypes. Verification of behaviours from the video data and confirmation of inter-contextual cues as important aspects for users.

Table 4.5. Methodology for study one.

Post Trial - Expansion of the situations covered

Analysis of observation methods trial data uncovered an unexpected finding. Many diary sessions provided examples of solitary private viewing. The prevalence of this type of viewing was surprising, as this situation has not been reported as a major viewing context within the literature.

Further analysis of the video data suggested, unlike engaged shared experiences, these consumption sessions were much more opportunist in nature and tended to happen only when free time and opportunity allowed. One participant filmed himself watching *The Apprentice* on BBC iPlayer in his bedroom, commenting to camera that on occasions he makes time at the weekend to catch up on favourite programmes he's missed from the previous week. There were many more examples of this behaviour including another participant who on arriving home from work unusually early "*took the opportunity*" to watch something of personal interest before their partner got home. In these cases there appears to be an element of opportunist consumption, but applied not only to mobile contexts but also to private situations in which high levels of attention are given to content.

The post hoc analysis of diary data from the three users involved in the observation methods trial showed that solitary viewing in private situations with high attention given to content accounted for almost one third of all viewing examples captured. This finding suggested that this viewing situation maybe a significant one for users, and an important context of use to capture, (based on the original justification for Archetype selection which included that they were representative of the majority of viewing).

Therefore a decision was taken to consider it explicitly within the main data capture on the basis that it also fulfilled the original Archetype selection criteria as laid out in Appendix A, Section 10.1.8. This new situation Archetype was classified as *Self Indulgence.*

4.3.4 Study Materials

The screening questionnaire used to recruit participants is reproduced in Appendix B, Section 10.2.

The interview questions used during the first interview are reproduced in Appendix C, Section 10.3.

The paper diary template used to collect viewing information from participants is reproduced in Appendix F, Section 10.6.

4.4 Results

A large amount of data of various types was collected and analysed during the study:

- 6 Transcripts generated from direct observation sessions.
- 22 Transcripts generate from entry and exit interviews.
- 63 Video clips of consumption situations generated by the participants.
- 363 Instances of viewing from the diary data.

Insights from the data as a whole are laid out in the next section.

4.4.1 Trial Study of Observation methods

At the point of beginning data collection for Study 1 both direct and self reported video observation methods were trialled. Three users known to the researcher were recruited, (in order to overcome experimenter effects by using Stoddart's (1986) strategy of personalising the ethnographer - informant relationship). By prior arrangement the participants were shadowed in a range of viewing situations (both private and public) of their choosing during the study period. In parallel they were asked to collect clips of some of the other times they watched video during the same research period using a small handheld mobile camcorder. Users were instructed to video the first few minutes of the viewing situation and to ensure they fully captured the context they were viewing in.

A number of contextual cues and important and interesting contextual themes were identified using both methods. The core aim in regards to evaluating the two methods was to analyse the benefits or otherwise of continuing to use two methods (or alternatively use either one independently) for the remainder of the study. There was also the possibility to add additional observational data capture methods if required for the research. Table 4.6 summarises the core insights identified using each method.

As the table demonstrates, self-captured video observation was able to provide better coverage of insight across the various contextual situations when compared to direct observation. The main reason for the difference was that with a video camera always to hand, users had more opportunity to capture the range of unique viewing situations in which they watched video. In contrast situations captured by direct observation relied upon the researcher being present. Direct observation however provided richer, more naturalistic information. Users when collecting video during the trial nearly always spent a few seconds adjusting the zoom on the camera and often offered a short narration to the camera to explain the context. Whilst this was useful for the researcher it undoubtedly interrupted natural behaviours. However these issues needed to be weighed against the feasibility of having the researcher always on hand to predict especially opportune moments to observe interesting or novel viewing situations. A number of other issues around experimenter effects were also highlighted during the trial. A particular issue existed around the prearrangement of direct observation sessions, which led to the creation of artificial viewing consumption situations. These issues are discussed in greater detail in Appendix E, Section 10.5.

Situations and insights identified through observation methods	Self Reported Video	Direct Observation
Public situations aimed at filling time.	x	x
Constraints to content choice and access in mobile situations.		x
Public situations tending to be solitary in nature.	x	x
Low attention and issues of disruption in public situations.	x	x
Early evening situations based more on social routines than content choice.	x	x
Sharing space but not content.	x	
Planning of social situations around content.	x	
Time shifting in later evening viewing.	x	
Planning and attention in shared later evening viewing.	x	x
Lack of tolerance for distractions in later evening viewing.		x
Users opting out of later viewing contexts to change location.		x
Solitary and opportunist viewing situations with high levels of attention to content.	x	
Content finishing symbolising the end of a viewing session.	x	

Table 4.6. Comparison of observation methods.

With no significant advantages in terms of the insights captured for the study into context, direct observation of participants had provided challenges both logistically and in terms of some elements of validity. On this basis the author therefore decided to cease direct observation as a data collection method within Study 1 after the initial trial. However the insight from direct observation had been useful and was fully incorporated into the study analysis results.

4.4.2 Diary data summary

Preliminary Situation Archetype Classification	**(n) examples in data**	**% of total sample of 363**
Quality Time	41	11.3%
Sharing Space but Not Content	21	5.8%
Opportunist Planning of Content Consumption	28	7.7%
Self Indulgence	154	42.4%
Others	119	32.8%
Total	**363**	

Table 4.7. Diary viewing examples as classified into the four situation Archetypes of interest using preliminary inter-contextual cues.

Breakdown of *Other* sessions	**(n) examples in data**	**% of total sample of 363**
Sessions meeting the cues for the Quality Time situation Archetype except the viewing duration was less than 30 minutes.	46	12.7%
Sessions meeting the cues for the Quality Time situation Archetype except the viewing device was not the main TV.	12	3.3%
Sessions meeting the cues for the Family Viewing situation Archetype, which was identified in literature but not directly investigation in the field study.	39	10.7%
Sessions meeting the cues for the Content as Time Keeper situation Archetype that were identified in literature but not directly investigated in the field study.	5	1.4%
Sessions in public situations not meeting the cues for Opportunist Planning, (such as at cinemas or on shared big screens).	17	4.7%
Total	**119**	

Table 4.8. Breakdown of diary viewing examples which could not be classified into the four situation Archetypes of interest.

A more detailed summary of the diary data can be found in Appendix F, Section 10.6

4.4.3 Main Findings and Themes

Viewing outside the home occurs in a small number of core situations.

The major context of use outside the home was in work environments, (diary examples n=22, 49% of public viewing). Sometimes this was for work activities, but more commonly use was during break times and lunch hours. The second most common situation was train commuting, (diary examples n=7, 16% of public viewing).

> *"Usually if I'm watching something outside the house it's when I'm travelling, like when I'm waiting in the airport or travelling by train or something, then I watch on my computer...but that's because I have nothing else to do." Participant 7.*

A further commonly reported situation was watching sporting events, and especially football matches in bars. (diary examples n=5, 11% of public viewing). These were the longest duration viewing sessions outside the home, with users reporting each lasting over an hour. Other less frequently reported examples of public consumption included visits to the cinema n=2, and viewing information on large public display screens n=2 (Figure 4.2).

Viewing on personal devices in public places is a solitary experience.

All direct observations in which users viewed on personal devices in public were solitary. From the video data only one participant provided an example of consuming video with others on a personal device in public. This was to share user-generated content from YouTube on a smartphone. The frequency of shared public viewing was captured by the diary data (n=12, 27% of public viewing). However this consisted of all examples of shared public viewing including watching sport and cinema visits. Only 3 examples of screen sharing on mobile devices in public were captured.

Figure 4.2. A participant captures themselves and others watching a public screen.

Few viewing experiences in public appeared planned. Rather, users found themselves in situations where they did not know any of the people around them and so used interactions with their devices as a way to fill the void that would normally be filled by social interplay. As example, after one direct observation session a participant noted that due to rotating shift patterns in his team he can't take breaks with the people he works with, and so must always take his breaks alone. When he comes to the work cafeteria often he finds it empty or doesn't know any of the people in there.

Public viewing sessions on personal devices are highly constrained by temporal factors.

There was evidence of public viewing situations often being controlled by the environment. As example one user who watched mobile TV during his lunch break had to finish part way through and return to work, (all three of his diary examples in this context lasted exactly the 30 minutes break time duration). Participants travelling on the train were also highly constrained by time. Though the duration of the viewing experiences varied, programmes were often cut short by aspects of the situation (usually the train arriving at the participant's station).

Evidence of dipping in and out of mobile content was also noted in the context of keeping up to date with live events. This was particularly noted in interview for live sport (n=7, 16% of public viewing).

The diary information additionally revealed that the duration of viewing situations (total time a participant watched in a single sitting) was shorter in length when watching in public (mdn=63 minutes) than in private (mdn=73 minutes). Additionally if cinema visits and sessions when watching sport on big screens were removed, the average viewing session duration fell considerably for public viewing (mdn=36 minutes). Only one public viewing session using a personal device lasted longer than sixty minutes.

Content choice in mobile environments is limited.

The observation data (both direct and through video) yielded examples of constrained choices over content. This was in consideration primarily of the current viewing situation but, (as later identified through interview) also because of other constraints including mobile connection access and availability of premium content. A participant travelling on the train had downloaded two thirty-minute comedy programmes from BBC iPlayer specifically to watch on their journey. During debrief the user commented that they selected this content because it was "*light and not too long*", adding it was ideal to dip in and out of on the train.

Laptops were the preferred option for video consumption in mobile environments (n=19, 42% of public viewing). Convenient and opportunist access to content through the internet, ease of connectivity to other devices, and access to physical media made this device easier to use than mobile telephones and other personal devices.

> *"I sometimes take DVDs with me, or I just seem to have the files already on my computer. I don't go to that much effort but I usually have something with me." Participant 3.*

Mobile public viewing was full of distractions and users appeared less attentive towards content.

The mobile environments observed appeared to have more physical distractions such as background noise and visual activity compared to private ones. However this was observed as serving more as a minor interference rather than a real impairment to viewing. There were also a number of instances of participants choosing to wear headphones (presumably to block out background auditory distraction or perhaps simply to be polite to other people around them) whilst watching in these situations.

Other issues that drew attention away from viewing included specific events in the environment and the proximity of other people. On the train, people moving around in the carriage and also events such as pulling into busy stations appeared to interrupt viewing. Distracting auditory events included a fellow passenger's phone ringing and numerous tannoy announcements. Based on the observations this issue was explored further in interview. A key distraction noted by 8 of the 11 participants was proximity to others and the perception of being observed. In some cases this even involved people watching content over the participant's shoulder. Similarly in the work canteen significant distractions observed included other people entering and exiting the room, the auditory interruption of the use of vending machine, and decisions by groups of co-workers to sit close by. These disruptions manifest themselves in the form of the user momentarily glancing away from the screen (Figure 4.3), in some cases turning around to see what was happening, and in other circumstance repositioning themselves or the angle of their device.

Figure 4.3 During shadowing a participant (in the blue shirt) is distracted by events outside the window whilst attempting to watch a video on the train.

Users themselves also seemed to create their own distractions. These included continually checking the time (4 of the 9 participants who watched in public), eating (6 of the 9), and checking their mobile phone for new messages (5 of the 9). It appears that in these settings users often wish to remain aware of the situation around them and are not seeking to become overly engrossed in the video they are consuming.

Viewing in the work environment can be opportunistic.

There were a number of examples of viewing at work captured from the video observation data, both on mobile devices and also work computers at participant's desks (6 of the 11 participants viewed at work). Users report that viewing in these situations was entered into in an opportunist manner.

> *"Sometimes at lunchtime I'll check something out on the off chance. In our office we send around news or YouTube clips just randomly during the day, a new discovery, or something that just came out over the news." Participant 8.*

Examples from the diary information showed consumption mainly as a lunchtime activity, and usually carried out in parallel to eating (observed in 12 of the 22 examples of viewing at work). Watching video in such situations is really little more than a distraction from work and used to pass the time. One participant commented on the choice in activity they have in these scenarios, consuming video is only one option. Users also reported carrying out other activities such as reading the paper.

> *"…occasionally I will try and fit in something from iPlayer in my lunch time, which is between 12 and 2, but not often, and only if it was a quiet day at work. I don't always get a proper lunch break." Participant 3.*

Work environments also offer their own specific distractions and constraints. The majority of users who watched in these environments (5 of the 6) reported having to be concerned about watching content that might be inappropriate. Also within some offices participants wanted to avoid being caught watching video from sources such as iPlayer or YouTube because they believed this would make them look unprofessional. Again this raises the issue of perceptions of being overlooked as a distractor in public viewing contexts. However when no one else is around, viewing in public can also become quite private.

The video observation data provided a good example of this, in which the user was seen scanning the office door whilst watching YouTube (see Figure 4.4). When later questioned during interview, they reported that they had a particular office manager who they didn't want to be caught watching video by.

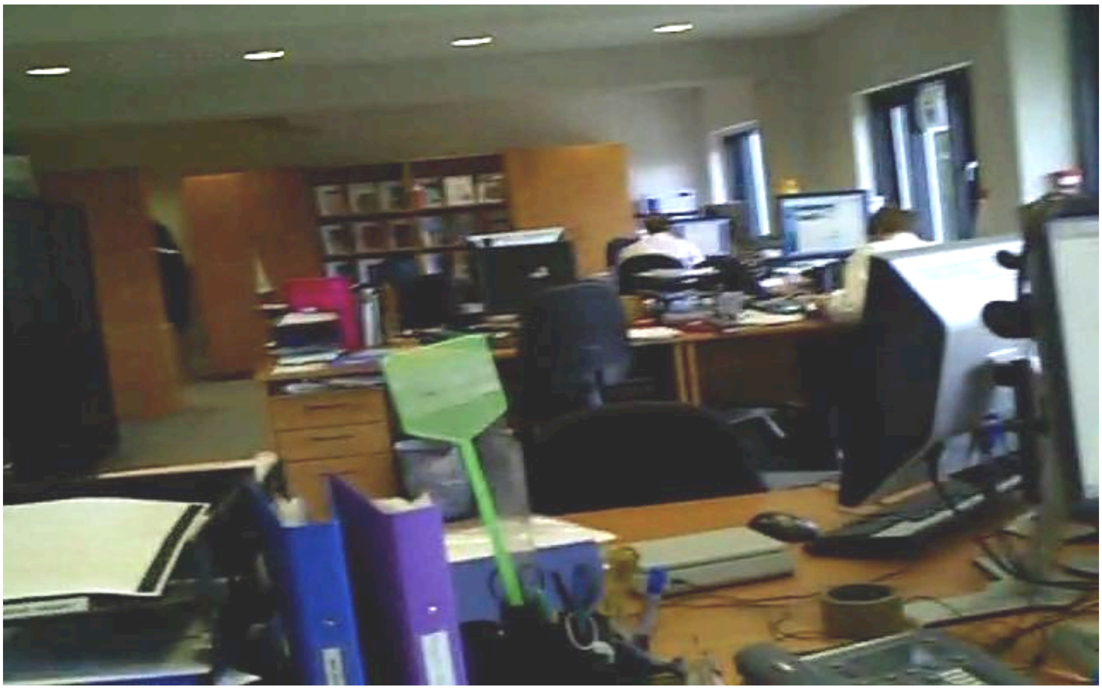


Figure 4.4. A participant scans the office door whilst watching at work.

Most viewing at home happens in the evening.

Information from the diary data showed that the majority of viewing examples captured by the participants (in fact over six times as much) occurred in people's homes rather than outside in public (diary examples in private n=318, in public n=45). This in turn affected the times when content was watched. Nearly half of all the reported video consumed during the study was done so after 7pm, (diary examples n=179, 49% of all examples).

Early evening private viewing contexts are very social.

Many video clips from participants depicted early evening viewing contexts with other members of the household present. These tended to occur between 4:30pm and 7pm but precise timings depended upon an individual family's routine, (diary examples n=39, 65% of private viewing examples captured during this time period). In many cases food was either being eaten or cleared away. In both the video and directly observed situations family members were clearly not particularly engaged with the content, and emphasis was rather on being social and sharing time with others.

"Yeah that's very common, it's like that nearly every night. One of us will be cooking and in and out of the living room. There is no door between the kitchen and the living room, so you can chat and hear it (the TV)." Participant 2.

Participants chatted about their day and made comments about the content as they watched. In one situation a father and son were watching snooker and chatted about how the match was going and the general presentation of the programme. Conversation then moved onto other things about their day. Another example showed a daughter returning from work and starting a conversation by talking over the television. This did not seem to disturb the other family members who had been watching. A little later the daughter and mother left the room mid programme and continued to chat outside in the kitchen whilst they prepared a cup of tea. Neither of them made any comment regarding what they had just been watching on the television.

In most cases social family viewing of this type occurred in the living room in front of the main television (29 of the 39 diary examples), though in one video example the family sat around a dining room table watching a small portable TV on the sideboard. There was also evidence of this general viewing situation evolving into more planned viewing later in the evening. In one video clip captured in the early evening, the participant reported that she was about to cook dinner, after which they would "settle down for a night in front of the television".

During the early evening families share space but not necessarily content.

A number of examples from the video clips showed families sharing space but not necessarily the same content, (diary examples n=18, 30% of private viewing examples captured during this time period). A typical situation captured was the daughter in a family sat on the floor in the living room surfing the Internet on a laptop. At the same time the other family members were watching TV in the same room. Another example in a different household was as some family members watched others milled around between the living room and the kitchen whilst someone was cooking.

This type of multi tasking was fairly common with many examples of people surfing whilst watching the TV both when viewing alone, but more significantly when others were also watching (n=21, 6.7% of all viewing in private) see Figure 4.5.

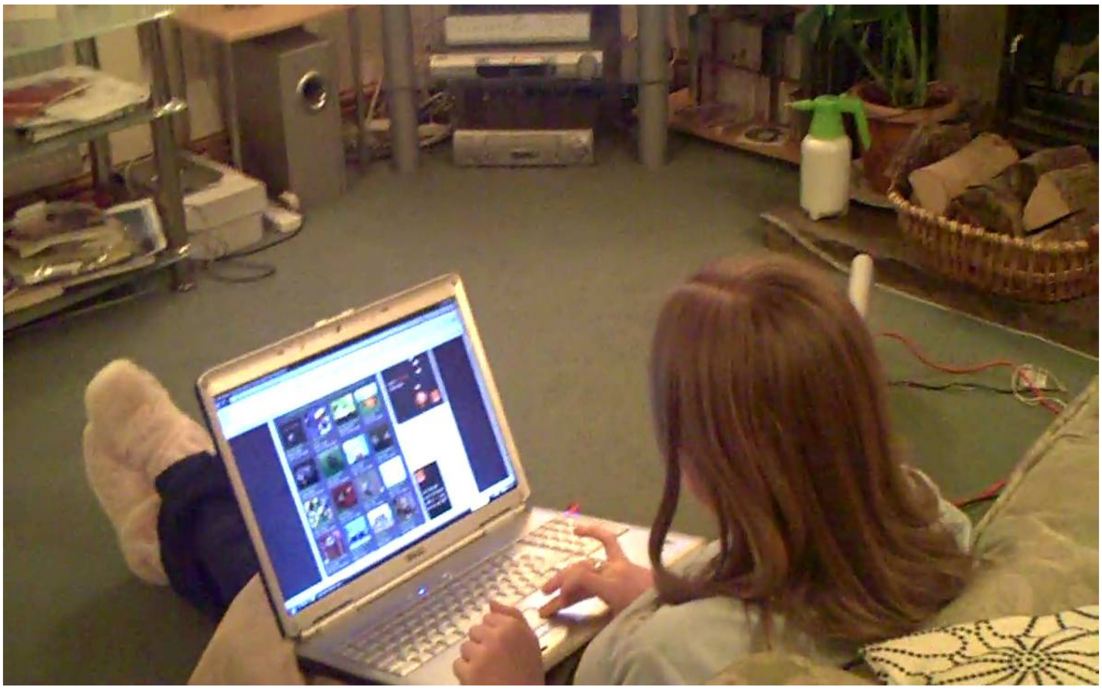


Figure 4.5. The family TV was on whilst this user watches videos online in the same room.

> *"…Paul will be watching the TV, and I will be talking to my sister on Gmail…so normally she will also be talking to four or five other people, so if you are just chatting to her, you might be waiting for a minute or more between each reply, so I watch YouTube videos whilst I'm waiting for her, then messaging her, and then waiting again. I'll watch half of it, pause it and go back…and I'll also have one eye on the TV at the same time." Participant 4.*

With later evening viewing came greater planning and attention to content, including use of video on demand.

There was evidence that early evening social consumption evolved into more planned and engaged viewing as the night continued past 7pm. In one household the mother was very specific to tell her son not to "*get into anything*" as she wanted to watch Eastenders at 8pm. The family who were visited for observation at 8pm reported that they had just watched the soaps during dinner before the researcher arrived but were now going to watch some programmes they had "*saved up*" from over the Easter weekend. In both cases the participants knew exactly what they wanted to watch. This last example was also directly observed evidence of content being time shifted, (the behaviour of saving up recordings from other times to watch in peak viewing contexts).

There were numerous examples of video on demand behaviours captured. In total 154 diary sessions (42% of all content) was not watched in real time from a TV schedule. This figure broke down as n= 41, 11% of content time shifted, and n = 113, 31% originating as video on demand.

With planning also came greater involvement with content and considerations such as the ambiance of the viewing situation. During interview, comfort, video quality and atmosphere all appeared important for participants. Creation of cinematic type experiences also became more prevalent. There were examples captured on video of people moving furniture and changing lighting in these situations to improve the environment before settling down to watch (Figure 4.6).

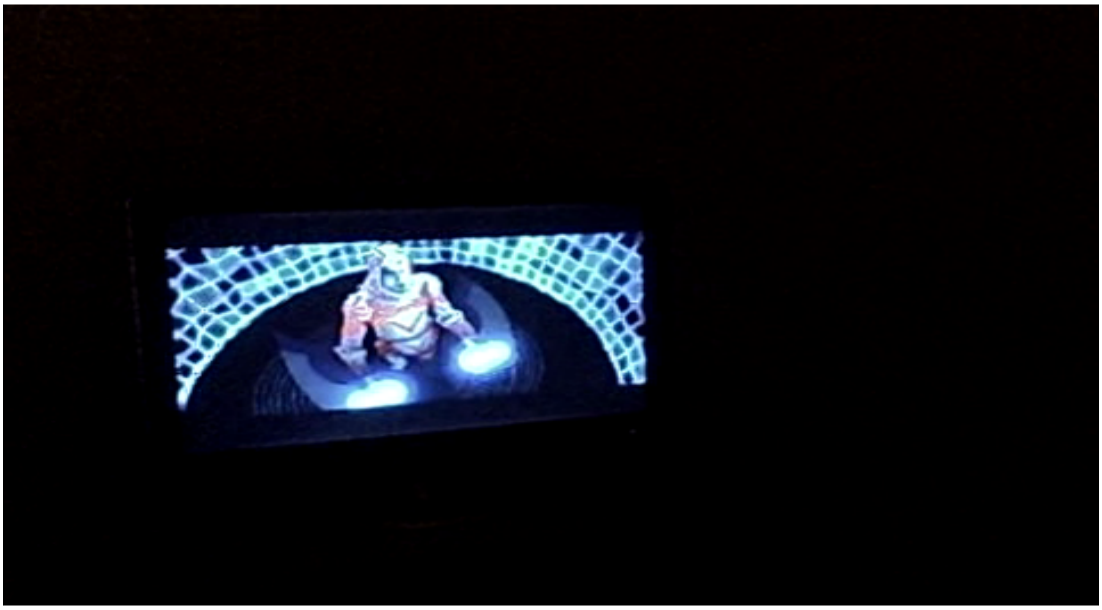


Figure 4.6. An example of users dimming the lights to watch.

Later planned viewing showed high levels of attention towards content, and sharing these experiences seemed important.

Planned for content appeared to engage users more. In the house where the daughter and mum had been chatting in the kitchen, when Eastenders came on they both moved back through to the living room to watch it. At this point chatting stopped and they concentrated on the content. The same concentration was observed in people who had time shifted content. Very little conversation was observed in these sessions and the users were obviously focused on the video.

Despite the fact that much of the conversation stops during these periods it was clear that sharing viewing in this context with significant others was perceived as shared quality time. One video clip example showed a participant and their partner sat on the couch at home in a darkened room. They explained to camera that they had been looking forward to *The Inbetweeners* movie and had recorded it earlier so they could sit down and watch it together. When questioned later the participant noted that it was important they watched together as it would "*spoil it if one of us had seen it first*".

“I think it’s important to do things together, and one of the few things we do is sit down and watch television. We do go for walks but television is one of the main things….I don’t want to sit in front of the television watching rubbish, so sometimes I will look specifically in advance to find something we will both want to watch.” Participant 5.

Though evening viewing was primarily shared, in larger households people opted in or out at the start of the session.

A natural break was seen to occur between less engaged viewing in the early evening and viewing later on. At this time there was a lot of movement in the house with people getting up to go to the toilet or clear away plates before deciding to settle down to watch or not. The observations uncovered three examples of opting out from shared evening viewing, (and n=12 diary examples). All of these were from young male participants who lived with their families. They commented during the debrief interview that despite sitting with their family during the early evening, they preferred to go to their rooms to either listen to music or watch something more to their tastes later in the evening.

“If mum is watching something on Sky, I’ll have to go upstairs to watch Match of the Day or something. So we sometimes split up. My mum will be watching BBC news on Sky, Laura will go to her room and watch E4, something like Holly Oaks and I’ll watch something in my room.” Participant 2.

On the occasions when the social group does break up it creates opportunities for solitary but engaged viewing.

These viewing situations often occur in areas of the house other then the living room, such as in bedrooms or conservatories. There were examples of users using on demand technologies to seize on these situations in order to consume content of personal interest in an opportunistic manner.

“I use iPlayer, particularly to watch the apprentice actually…the reason I use it is a 50 / 50 between the fact that I like to watch different types of things to my mum and dad, and also on a personal level I find I can concentrate on what’s being said, without interruption if I’m isolated in my bedroom.” Participant 3.

Examples of these behaviours were truly device agnostic with video clips and diary entries showing this behaviour occurring on TVs, online and mobile devices. In all cases these were experiences in the home, in private situations, and opportunistic in nature rather than planned. One participant discusses the use of her iPod in such situations:

> *"I've done it a few times; it has been more than one series. I remember the first series of Damages. He really wasn't into it so we didn't watch it together. I have a pillow with a speaker in it, so I lie there and watch it whilst he is a sleep…I'll load it on and then watch them when I get the chance. Because again I'd rather get a whole series at once like I do with the DVD's rather than an episode at a time, so then I can catch up and watch it as and when I like." Participant 1.*

The diary data showed that solitary private viewing made up a significant proportion of all the video consumed (n=154, 42% of all private viewing). For some users comfort and video quality were mentioned as important during interview. These appear significant factors whenever viewing is highly engaged.

> *"Because of the comfort factor I probably wouldn't watch main things on there (points to laptop). So take for instance Tron. I downloaded it a couple of days ago and it won't burn to DVD which is annoying, but I still won't watch it off the computer, I'd plug it into the big screen TV so I can relax in the recliner, and that's what I'll probably do." Participant 6.*

Planning around programmes created further social situations.

A further situation observed during the evening was planning around content by social groups extending outside of the household. One participant reported regularly holding *Soap and Sandwich* nights with her female friends. This consisted of getting together at someone's house to share a sandwich and a bottle of wine whilst watching one of the major soap operas. This user also captured two separate examples of this event during the study using the video, one at her house, and one at a friends (Figure 4.7). As with other early evening contexts this situation seemed very social, with the main actions and attention of the users focused around chatting and eating. Other examples of this social phenomenon were film clubs and movie nights, (diary examples n=7).

"We also have film nights where we go over to a friend's house to make a night of it and watch a movie together. We did it last week but my friend cooked for everybody first, so it got too late and we ended up not getting to watch the DVD." Participant 6.

Figure 4.7. Planned social situations surrounding content were surprisingly common.

Sometimes socialising around content was done remotely. The study provided two examples of this in the diary data that was later explored with the users during interview. The first example related to multi-tasking. The participant would chat to friends and family on instant messaging on the laptop in front of the television. These conversations were reported to sometimes focus on the content being watched on the TV. The second example related to the relevance of the content itself, sparking the need to communicate and share with another person.

"My friend is dipping his toe into the world of stand up comedy, he's done a few shows. So he texted me to see if I was watching it, and I was, so it just kind of went back and forth, about who we thought he was the most like, and who should he try and be more like, it was fun…I would have probably given up and gone to bed if he hadn't been texting me" Participant 1.

4.5 Discussion

The study uncovered a number of insights that inform understanding regarding real world viewing situations.

4.5.1 Effects on perceptions of viewing situation

Though factors such as viewing quality and perceived comfort were important for users in terms of engaging with content, the single biggest factor differentiating viewing situations was whether the environment was public or private. Apart from during cinema visits there was no evidence of users giving full attention to content in an everyday public situation. In contrast, the study uncovered numerous examples of users giving high levels of attention to content when they were alone, with friends and with family in private situations. Examples covered living rooms and bedrooms, on the main family television, laptops and personal devices.

Currently the reasons for this division in experiences between private and public can only be hypothesised, but both user expectations and their wishes for how much attention they want to give to video in public situations appears key. The viewing environment in these situations is busy, full of distractions and associated with its own unique set of technical constraints. Tamminen et al. (2004) identified similar constraints, however this study identified that social conventions also appear to play a powerful role, with users themselves commented on the lack of comfort associated with perceptions of being observed when viewing in many public situations. In fact numerous instances were captured of the users themselves (rather than trying to block distraction out), actively attempting to remain aware of their current surroundings.

Ease by which to access and retain content appeared key factors in decisions surrounding which mobile devices to consume video content on outside the home. Rather than screen size or device mobility, convenient and cheap access to content appeared the main influencing factors in device selection. Therefore a variety of mobile devices were utilised based on personal choice with little association to individual viewing context.

Within private personal spaces, both temporal and social factors appeared key contextual indicators. The evening routines of TV consumption described by Taylor and Harper (2003) appears to still be valid within UK homes. The move from highly social and unengaged viewing, to planned and highly engaged viewing later in the evening was prominent and predicable in all the households during the study. Cinematic and visual experiences additionally become prevalent as the evening progressed. Though the exact timing of transitions through these contexts varied from household to household, the flow through the evening routine was consistent.

One big change to the evening TV consumption pattern Taylor and Harper (2003) described is the significant move away from scheduled content. The study uncovered numerous examples of content being stored up on set top boxes, streamed through Internet connected devices or rented from DVD clubs for consumption in these prime time contexts. Another key indicator of these experiences was that viewing was planned (though sometimes at short notice). This was either in the form of one off programme events, (such as a movie) or as part of a weekly viewing routine, with favoured programmes watched back to back. Many users reporting attaching particular social significance to these situations and felt it was important to share them with significant others. Despite this sentiment actual social interaction between users in this context was very low.

A further key finding from the study was the large amount of solitary, high attention viewing that occurred in the home. This was not expected prior to conducting the study. Based upon the low amount of discussion in this area provided in the literature this would appear a relatively new phenomena which may have been fuelled by the now numerous alternative routes into content which new technology has afforded. Though there was still a large amount of engaged group viewing in front of the family TV, some family members (and especially in households with older children) now have much greater choice in whether they wish to opt in or remove themselves from the family viewing situation in order to pursue their own programme preferences elsewhere. In these circumstances access to on-demand content appears to be a significant driver with most reported use of on-demand Internet video services being solitary.

4.5.2 Verification of inter-context cues.

Inter-context (Clancey, 1993) is the product of all interactions in the physical world. Contextual cues therefore are the behaviours and characteristics manifest within the environment that define the social share reality (Semin & Smith, 2002) and our meanings of place (Harrison & Dourish, 1996).

Originally three core Archetypes situations were identified in the literature for analysis and verification of hypothesised inter-context cues. Could the contextual criteria originally identified from the accounts in the literature at the start of the study be verified as indicators of those viewing situations?

Verifying the contextual cues of Quality Time.

The literature described a viewing situation that occurs within families when they choose to enjoy viewing together. Typically this is in the evening and after the time when younger children may have gone to bed. In many homes this appears to be regarded as the quality consumption opportunity, and is reported by Taylor and Harper (2003) as the time when the most engrossing viewing is likely to occur.

This Archetype was indeed identified both within video and direct observation data. Coding of information collected from the diary study identified 41 instances (11% of all viewing examples). The hypothesised and validated cues are shown in Table 4.9.

Hypothesised Cue	Validated	Description
The user experience occurs in shared private space.	Yes (and refined)	Invariably in the comfort of the living room, but also den's and conservatories, (An additional 12 examples of quality time like viewing were captured which did not use the main TV).
The experience is shared with adult family members.	Yes (and refined)	By couples and other closely associated social groups such as housemates and friends.
The user is not observed by anyone who is not sharing the viewing.	Yes	Householders who do not want to share viewing remove themselves from the local environment.
The consumption experience is long (over half an hour).	Yes (and refined)	Consisting of single or stacked numbers of content items.
The user has control over the length of the experience.	Yes	The viewing experiences ends when the final piece of content finishes.
The family television is used.	Yes (and refined)	Large TVs are used but content is accessed from a range of sources.

Table 4.9. Hypothesised and validated cues for Quality Time.

The core cue validated in the Quality Time situation was that all examples occurred in a shared private space. Other hypothesised factors were also validated through observation, detailed diary data and clarification in interview. Though it is true this situation when observed was always shared between at least two people, it was not always the case that these were family members, and sometimes experiences extended to friends and other housemates. The important factor appeared to be that a social bond is shared between the individuals, which allow them to comfortably relax in each other's company.

The observational data also captured individuals opting in or out at the start of these viewing experiences. So if the user wished to engage with the content they were drawn in, if they didn't they withdrew. Whilst this usually involved removing oneself from the room, in open plan homes users were observed retreating only to the point were they were not disturbing (or being disturbed) by those watching.

These shared experiences occurred almost exclusively during the evening after the dining routine, this appears a further refinement to temporal cues. Defining the situation further is complicated by the (often subtle) transition into Quality Time from more social Family Viewing, (of which 39 examples were captured). These were often very similar in some households and only true transition occurred when viewers "got into" the content they'd decided to watch. The transition to Quality Time was much clearer if users took steps to alter the physical environment before viewing, (by taking action such as lowering the lights).

Whilst true Quality Time experiences did last for at least 30 minutes, an interesting finding was a number of "failed" Quality Time sessions captured in the diary data. These examples met all the other cues for Quality Time but the users decided to abandon the sessions early into the content. 46 examples of this were seen in the diary data, (12.7% of all viewing). Whilst not all the examples could be discussed with users, reasons cited for abandoning the sessions in such situations included technical difficulties with streaming content, unplanned interruptions from other people, and also lack of interest with the content itself.

Validating the contextual cues of Opportunist Planning.

This Archetype identifies the behaviours of individuals who make content available to their mobile devices in anticipation that an opportunity to consume it will present itself in the near future. Though users do not make specific plans to watch, they are reported as engaging in a form of loose planning so that content of interest is always available when they find themselves in a mobile situation where they need to kill time.

Such behaviour was indeed both reported in diary and observed during the study (n=28, 7.7% of all diary examples). This consumption situation was also reported as everyday user behaviour during the interviews by a number of participants.

During the study, users did indeed load content onto their mobile devices, but consumption was not limited only to public situations. As example, a participant loaded content onto their iPod to consume in an opportunist manner when out and about, but actually consumed it at home. This suggests that the opportunist behaviour of loading up content onto a mobile device for consumption at some later date may actually facilitate two types of viewing. Firstly the public situation identified in this Archetype, and secondly a more engaged private viewing scenario. Again the private / public aspect of viewing context appears a significant factor in influencing the perceived viewing situation. The example in O'Hara et al. (2007), that describes users time shifting content into contexts outside the home might therefore not necessarily be based on a motivation to free up time spent watching in the home as that author hypothesised. Rather it may just be the case that users wish to maximise the possibility to watch things matching their preferences whenever the opportunities arise. This finding evidentially points to the parallel existence of more engaged solitary viewing experiences that in turn suggests Opportunist Planning actually represents two distinct forms of consumption (see Figure 4.8).

A distinction needs to be made between the discovery aspects of Opportunist Planning and the consumption, (which represents the actual viewing context). The contextual cues notes in Table 4.10 refer to viewing in public situations. Private opportunist viewing is considered through the formation of a new individually characterised viewing situation Self Indulgence, (see next section).

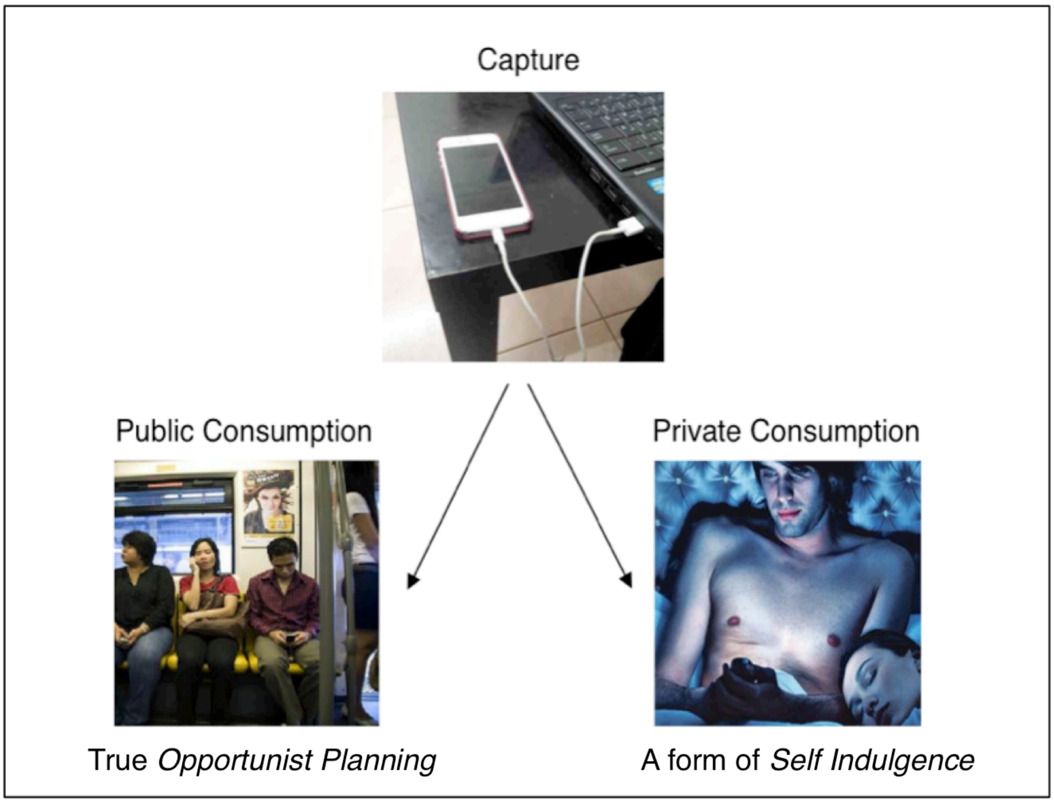


Figure 4.8. Pre-planning enables two different viewing situations.

Hypothesised Cue	Validated	Description
The experience is solitary.	Yes	Viewing is not shared.
The experience occurs in a shared public space.	Yes	Examples captured in the workplace, on transport, in cafes, and other public areas.
The user can be observed by strangers not sharing the experience.	Yes	People around the viewer can often see the screen.
The consumption experience is longer than in Archetype one (creating privacy in public spaces).	Yes (and refined)	The prospective consumption experience needs to be long enough to offer a worthwhile opportunity to watch.
The user has little control over the length of the experience but visibility of the likely duration.	Yes (and refined)	The user estimates the time available but has little control over the actual end point due to environmental constraints.
A mobile device is used.	Yes	Laptops and mobile phones.

Table 4.10. Hypothesised and validated cues for Public Opportunist Planning.

Temporal aspects appeared important in Opportunist Planning. In order to invest in the experience, the user needs some visibility of the likely minimum viewing length and importantly a likely duration long enough to make viewing worthwhile. No one during the study reported storing up a two hour movie to watch in twenty minute chunks over the course of the weekly commute. Instead, programmes roughly matching the situation were sought out, e.g. “light” thirty minute comedy programmes. This would appear to explain why this situation is employed so often over work lunch hours and when commuting on public transport.

User discussions of services such as BBC iPlayer introduced a further complexity to defining opportunist viewing. In this same viewing situation users reported also conducting unplanned opportunistic viewing. These were scenarios where the user used wireless technologies to access and stream content from the Internet. The types of video accessed included both ondemand and scheduled content, in fact 16 of the 28 examples of viewing in this situation were actually video on-demand. Despite the lack of pre planning in this context the same constraints of the situation applied.

The lack of control over the end point for the experience was also verified as a contextual cue. This was manifest in examples of participants ending viewing early due to contextual constraints. The core example being a user arriving at their station during a train commute.

Discovery of Self Indulgence.

This was a new Archetype situation initially identified from the diary data collected from the first group inducted onto the study. A large proportion of the consumption situations captured did not fall into any one of the key pre-identified Archetypes. This suggested a significant viewing situation may not have been captured by the literature review. Investigation of the data identified many of these to be solitary viewing, often of significant length. These were investigated explicitly through the video observation and interviews in the follow on groups. The author has termed this new Archetype Self Indulgence. This situation sees individual users taking opportunities as they arise to consume personal content of real interest when alone (n=154, 42.4% of all viewing). The diary data also recorded a large amount of on-demand consumption in these situations from PVRs and VoD websites such as BBC iPlayer and Channel Four's 4oD (67 of 154). The newly formed context cues for this Archetype are noted in Table 4.11.

Discovered Cues
The user experience is solitary.
The experience occurs in a private space, (all around the home).
The user is not observed by anyone.
The user utilises any viewing device available to them, including mobile devices, home computers, game consoles and the family TV.

Table 4.11. Discovered cues for Self Indulgence.

Self Indulgence is opportunist in nature. It can happen at different times of the day and on many different devices. Therefore timing of the experience appears unplanned. During interview, users themselves identified these situations. The Archetype covers many different locational, device and temporal contexts. In all cases the consumption was solitary, engaged in nature and conducted within a private viewing situation.

Over a third of the total number of instances of consumption captured through diary were categorised under this Archetype. Though we can only see this finding as indicative, it would suggest that this situation is frequent enough to be strongly considered in design analysis amongst the other identified examples of viewing.

Validating the contextual cues of Sharing Space But Not Content.

The Sharing Space But Not Content Archetype describes family groups who spend time in the same physical spaces as each other but who engage in different activities and content choices. A study by Vorbau et al. (2007) identified an extension to this activity through the use of mobile products as secondary consumption devices in shared social spaces.

This situation was identified within the study on numerous occasions, and most strikingly through the video and direct observation data. In all, twenty one instances were identified from within the diary data representing 5.8% of all viewing examples. The contextual cues for Sharing Space But Not Content investigated during the study are shown in Table 4.12.

Hypothesised Cue	Validated	Description
The user experience may or may not be shared.	Yes (and refined)	Sharing depends on the number and focus of family members present.
The experience occurs in a shared private space.	Yes	Usually the living room as the family TV is often involved.
The user can be observed by other family members not sharing the experience.	Yes (and refined)	This usually involved someone else in the room, (and often on the same couch as the viewer) using a different device or involved in a different activity.
The consumption experience is long, (over half an hour).	Yes	Consumption tended to be half hour shows.
The user has control over the length of the experience.	Yes	The viewing experiences ends when the content finishes.
A mobile device is used in parallel to the family TV.	Yes (and refined)	Device examples included phones, laptops, MP3 players and handheld games consoles. However not all parallel content consumption was digital. Other examples included reading books and newspapers.

Table 4.12. Hypothesised and validated cues for Sharing Space But Not Content.

Evidence for the cues of this situation were apparent within the study data. User focus in the Sharing Space But Not Content Archetype actually appeared much more to be on sharing social spaces than consuming content. Users who did not share the viewing experience from the main television actually carried out a myriad of parallel activities including chatting, reading, and surfing the Internet. In addition the boundaries between inclusion and exclusion from the viewing experience are less defined than may have been initially envisaged from the literature. The interviews uncovered numerous examples of users dipping in and out of the content on the main television, as well as the phenomenon of having "one eye" on the TV and the other on the parallel activity. Users also appeared less attentive to video content when conducting parallel activities.

Temporal aspects appear less important in Sharing Space But Not Content situations. Examples from the diary data were spread from early morning, right through to late into the night. Examples from early evening tended to run from when people came home until the time after they had eaten and perhaps decided to settle down for the night. Session direction did tend to be over thirty minutes, though the actual timing appeared less significant.

Experiences were mainly shared between members of the same family or household. There were also examples of situations where the viewing was shared with visiting friends although this was less common.

4.5.3 Implications for the design of adaptive video systems

The study provided insights on viewing context and offers significant understanding of how designers of technical systems could approach the issue of viewing context.

Supporting the four key contexts.

This study uncovered that rather than attempting to understand the great complexity of the physical, technical and social world, a technical system could possibly provide beneficial contextualisation of a viewing experience by simply identifying and supporting core Archetypes for typical situations. Rather than constructing a complex system to identify every contextual nuance, user research of the activities to receive contextualisation may be enough to reduce the situations to core consumption Archetypes. Rule sets to then identify the context cues related to those Archetypes can then be incorporated as a model into the technical system.

Based upon an analysis of consistent and defining cues across the four Viewing Archetypes. Figure 4.9 lays out a simple structure for how a system may possibly model viewing context. Other viewing situations that were also captured in the study are additionally represented in the figure to show how they can be differentiated.

Based on the findings of this study the author advocates the following contextual factors as the most efficient means to differentiate between Archetypes. It's important to note that the study identified a much larger set of factors based on refining the cues for each Archetype, however the author argues four can provide the majority of differentiation:

- Viewing at home compared to out in public.
- Viewing alone compared to with others.
- Temporal factors.
- Attention given to content.

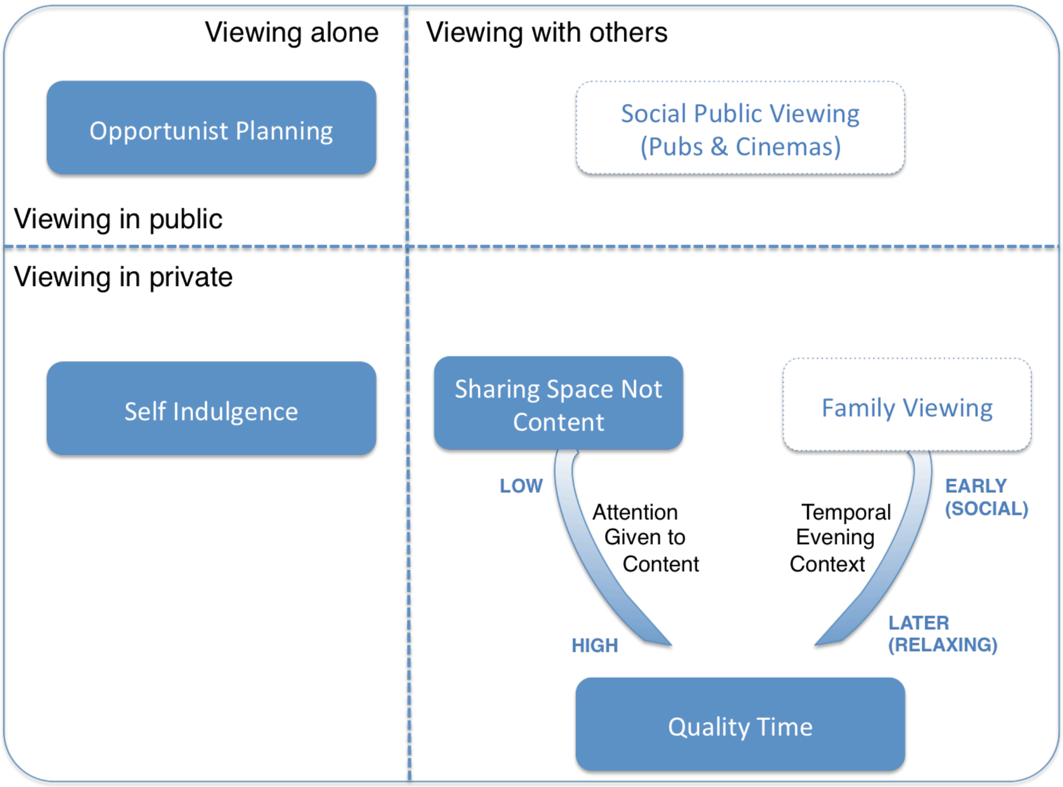


Figure 4.9 Archetypes of situated viewing on a simple axis of contextual factors.

Locational aspects: The division of viewing at home compared to out in public.

Throughout the study the division of viewing occurring either within a public space or a private home appeared a key factor in understanding the levels of attention a user was willing to give to content during viewing. It may be the case that users in busy public environments simply do not wish to switch off attention from the world around them in the same ways as they do when highly engaged in content at home. Additionally, feelings of being observed by strangers may significantly add to perceptions of uncomfortableness when viewing in public. Users appear to need a *safe harbour* in terms of a relaxed and socially unthreatening environment to allow them to make that step. In the vast majority of cases this was in a private home. Utilising this key contextual cue allows a clear and useful division of the contexts in which viewing occurs.

Socialness: Viewing alone or with others.

Whether the experience is shared or not again appeared a clear indicator as to the nature of the viewing situation the user was engaged within. Two of the four Archetypes investigated and verified could be directly identified by if someone else other than the user was also viewing.

Temporal aspects: When do you watch?

The final key factor in identifying the current context was the temporal situation. Time of day and daily come home patterns of behaviour were key to identifying the transition from Family Viewing to Quality Time viewing situations. A system that can learn these patterns and identify the transition point from one temporal context to the other is feasible from established research. For an example see Kappel, Proll, Rotschitzegger, Schwinger & Hofer (2001).

What is key to convey in concluding this section is that (as we know), not every possible viewing instance is covered by the four key Archetypes verified during this study. Logically then it will not be possible to identify every viewing situation correctly solely from the cues identified above. However using the diary data as a benchmark, just over 2/3rds of all viewing instances captured during the study fell into one of the four situations investigated. This approach therefore offers a third way between the current situations of no contextualisation of personalised viewing experiences and overly technocratic solutions to resolving context.

A solution which could reason and build relationships on the basis of the concepts provided here would maximise opportunities to improve the experience in the majority of cases, but in a lightweight manner than would not add huge complexity to existing adaptation models.

Attention to content: What do you do when you watch?

As discussed in the section relating to locational aspects, users appear to give differing levels of attention to content depending upon the situations they watch in. Whilst this was a key element in the division between public and private viewing, this factor was also at play in the home. Attention to the content and the execution of parallel tasks were key differences in the experiences of Quality Time and Sharing Space but not Content. Whilst all participants during Quality Time were fully focused on the content, at other times they carried out a myriad of additional activities. In the true sense of Sharing Space but Not Content, this included consuming alternative media on a secondary device. However other parallel activities also included reading, eating, working and even housework. Defining a method through which to understand the level of attention users are giving to content is key to differentiating many of the shared viewing situations in the home.

4.6 Conclusions

This study explored the key situations in which video consumption takes place and the social contexts surrounding them. The literature identified currently documented contexts of viewing and the corresponding contextual factors. In this study these were verified and augmented through empirical study.

Based on the insights from the observational and diary data it was additionally possible to identify the nature of the modifications users make to their viewing behaviours due to viewing in different contexts. The qualitative components of the study provided a rich snapshot of these settings and user behaviours.

Use of the diary method also enabled the identification of the most common situations of viewing and actually led to the introduction of a further Archetype (Self Indulgence) not previously documented in the literature. This was considered throughout the rest of the research in addition to the other three Archetypes investigated. Based on the diary data, over two thirds of all viewing instances captured during the study fell into one of the four situations described.

The presence of clear and relevant contextual cues that can be used to identify viewing situations provides an approach towards improving contextualisation for any type of video delivery system. Despite many cues being identified within each Archetype, the author provided a basic structure consisting of four factors through which the four Archetypes investigated can be differentiated. This model could be used to not only inform design thinking, but additionally forms a construct through which to consider viewing context more generally.

Identification and verification of the key contextual cues that describe viewing context affords a way for technical systems to consider adaption to viewing situations through a simplified model. This approach is very different from other existing models in the technical literature.

The core focus of the research now turned towards the user experiences observed within the contexts investigated. Whilst it was possible to identify that some viewing contexts are more social than others, and also that users appeared to have higher levels of attention towards content in others, this study provided no information on whether those experiences are enjoyable, engaging, or useful. This is an important consideration as for any adaptation system to be useful it not only needs an understanding of the contexts in which viewing occurs, but also an appreciation of the desired UXs within those situations.

5 Study 2, part 1. Measuring viewing experience in context.

5.1 Introduction.

There is now relatively ubiquitous access to video content in a diverse set of viewing environments and across a range of consumption devices. The question of how to offer the best UXs for discovering and consuming content in differing contexts is therefore become increasingly important to answer. Whilst systems that can both offer personalised content choices and adapt to the user's context provide a possible solution, user centred design is infrequently applied in the design of such technology (Jameson, 2008). This situation is concerning, when as noted in the initial introduction to this research, the perceived value of an adaptive solution goes beyond the content it presents, and actually sits in the viewing experiences it creates.

Within Study 1, a user centred approach was taken to validate the contextual characteristics of a number of naturalistic viewing situations. A structure was also proposed through which to describe viewing context using the concept of Viewing Archetypes. During data collection it became apparent that the quality of the underlying viewing UX achieved across contexts varied. However within the research to date we were yet to address which viewing contexts afforded the best UXs, neither did we know the factors within those contexts that influence UX.

In the review of related work in Chapter 2, Section 2.2.3 the state of the literature in relation to viewing user experience was explored. The range of work predominately addresses three areas:

- Studies that explore viewing behaviours within specific contexts of use (O'Hara et al., 2007; Bernhaupt et al., 2008; Saxbe et al., 2011).

- Studies that focused on deriving user requirements for future services, (Knoche & McCathy 2005; Strohmeier et al., 2008).

- Studies that attempt to measure specific aspects of viewing. Examples include video quality evaluations (Jumisko-Pyykkö & Häkkinen, 2005), user interface design evaluations (Chorianopoulos & Spinellis, 2006), and user perceptions of network performance impact on video delivery (Ghinea & Thomas, 2005).

The first two areas of literature are closely related and provide a range of insights around viewing practices and user behaviours. However these studies provide qualitative insight and are not focused on measurement of the experiences they describe. The third class of study does apply measurement to the elements they address, however these relate to specific aspects of viewing or are focused on evaluation of a specific concept design rather than viewing UX itself. Additionally due to the lab based psycho-perceptual focus of a number of the quantitative investigations in this area it is difficult to always relate the findings to real world video UX.

Within more recent literature (published after data collection for this study was conducted in 2010), there have been renewed attempts to quantify video UX. However these have been aimed at specific contexts of use, such as the development of a questionnaire for use with iTV entertainment equipment in the living room (Bernhaupt & Pirker, 2013), and methods for measuring the UX of mobile TV in unmoderated mobile contexts (Obrist et al., 2010). As these studies are device specific, (and in the case of Bernhaupt & Pirker context specific too) they cannot provide information on UX across viewing situations or insights on experiences independent of the consumption device.

Despite an extensive range of methods being used to quantify UX (Bargas-Avila & Hornbaek, 2011) currently there is no established method through which to quantitatively measure the quality of viewing experiences across contexts, or research that specifically addresses how viewing UX is effected by changes in viewing situation. Therefore to obtain the fidelity of insight needed to identify the factors contributing to viewing UXs, an analysis of viewing experience across viewing contexts is required.

5.2 Study Aims.

The focus of this study was to quantify viewing UX in naturalistic viewing contexts. The investigation set out to do this by measuring viewing UX within Archetype situations. By doing so, data from this study will provide a metric against which experiential factors observed within those viewing situations can later be analysed to understand their contributions towards supporting enjoyable and satisfying viewing. The primary objectives of this study were therefore to:

- Measure the quality of UX during video content consumption within naturalistic situations of use as identified through Viewing Archetypes.

- To understand if watching within particular Viewing Archetypes influence the measured quality of the UX, or if other key contextual factors such as the device used had more impact.

As no established metric currently exists to specifically measure viewing UX in context, a secondary goal (and initial consideration before reporting other results) was an evaluation of the UX measurement metric selected for use. Furthermore as the measurement method needed to differentiate positive from negative UXs, it was important that a confirmative measure of user satisfaction was also collected in parallel. Secondary objectives of the study were therefore to:

- Evaluate the selected viewing UX measurement method.

- Relate measured aspects of UX to a confirmative measure of user satisfaction.

5.3 Method

One data collection, two analyses.

The focus of the study was to quantify viewing UX across viewing contexts, however the wider goal was to discover influencing experiential factors. Measuring viewing UX affords the opportunity to characterise sessions by UX outcome. In follow on studies those sessions could then be investigated to understand the factors within those experiences contributing to those outcomes.

Fundamentally this represents a mixed methods approach that is well suited to applied research such as evaluations of quality, (Johnson & Onwuegbuzie, 2004). By combining both qualitative and quantitative techniques the aim was to provide a complete picture of the area of interest through the generation of complementary viewpoints. In the context of this study the approach critically required a single data collection process, as recommended by Greene (2007). This ensured both data types compared the same experiences.

Subjective measures and objective observations require different approaches to analysis and this broke the effort into two pieces of investigation. Sequential analysis of the two data types through an explanatory study design in which findings from each separate data analysis can inform and explain the other had benefits in this context (Creswell & Plano-Clark, 2011). By firstly evaluating quantitative subjective measures, that data could be utilised in the second investigation to identify viewing sessions of interest for deeper study.

This approach is shown in Figure 5.1. The results from the quantitative analysis will be presented in this chapter (Study 2, part 1), whilst the aims, approach and results relating to the objective data will be presented in Chapter 6 (Study 2, part 2).

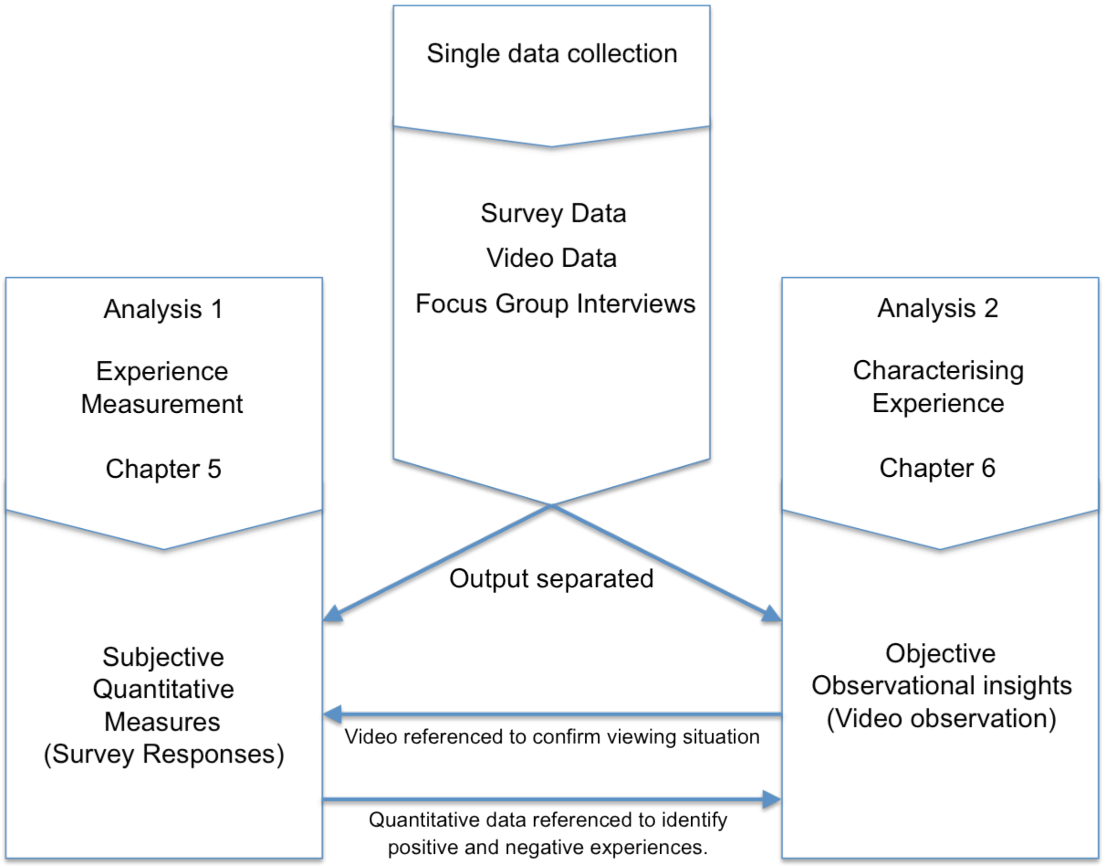


Figure 5.1. Summary of the approach for the studies into viewing UX.

5.3.1 Study Design Considerations

Delivery of the study aims required a research approach to characterise UX through measurement. As discussed in the literature (see Chapter 2, Section 2.2) the author defined UX as consisting of internal perception and emotional judgements in the minds of the user. Additionally the author supports Pirker and Bernhaupt's (2011) position that a common understanding is forming in the literature that UX is subject, dynamic and context-dependent. Therefore measurement of UX needs to be self reported, trajectory based (in that UX is transitory in nature), and adaptive (Law & van Schaik, 2010).

This puts a focus on subjective self-reported methods. These are discussed in the methods section in 3.4.2. However a key requirement was the ability to compare and classify UXs from different viewing sessions, and this suggested a quantitative measure. A self reported scale measure therefore appeared a logical approach. Firstly it is an ideal instrument for comparing technologies and applications, and can equally be applied during concept design as to assessing user responses to existing systems (O'Brien & Toms, 2010a). Secondly it is a portable method that can be used in nearly any context of use. Finally, examples exist in the literature of scale tools that have been used to measure interactions with technology in specific contexts of use (Mehrabian & Russell, 1974; Agarwal & Meyer, 2009; Obrist et al., 2010).

O'Brien and Toms' (2008) User Engagement Scale (UES) offered a further and prospectively valuable research tool for measuring viewing UX. An important methodological viewpoint considered in the discussion of UX in the literature review (see Chapter 2, Section 2.2.2), was that conceptually most models take the position that interaction is critical to the creation of UX. However the author takes the position in his own definition of viewing UX (see section 2.2.4) that the major activity within viewing experiences is in fact passive rather than interactive. Therefore engagement rather than interaction becomes the significant component formulating experience. As such, a measurement tool that from a methodological standpoint can be applied to passive experiences, when concepts of Flow or high degrees of interaction do not persist throughout the full experience is attractive. O'Brien and Toms (2008) document this process of ebb and flow through a conceptual model of engagement, disengagement and reengagement. Additionally the multidimensional design of the UES was hoped to allow greater analysis fidelity in terms of relating rating of subscales back to observed elements in the follow on study in Chapter 6.

A concern regarding the use of the UES is that at the time of writing it was yet to be reliably used in the context of measuring viewing UX. However O'Brien and Toms state the UES as an attempt to design a generalized tool for use with any application. At the time of the start of this study the UES had to date been used across a number of domains including E-commerce, web search, online gaming and educational webcasting and in all cases been found to be valid and reliable (O'Brien et al., 2008). This built confidence that the tool could indeed be generalised to use in other contexts.

Measuring Satisfaction

In addition to measuring aspects of experience through the UES tool, a secondary aim of the study was also to link those responses to a confirmative metric for overall user satisfaction. This was important because to infer that the factors observed on video within the proposed follow on study in Chapter 6 were contributing to positive or negative experiences, we need high confidence in the perceived outcome of the session from the perspective of the user. O'Brien et al. (2008) found elements of the UES subscale correlated to affect. Quesenbery (2003) also describes user engagement as a positive outcome of technology use and defines engagement as equating to satisfaction. However in the context of the UES, engagement is more a proxy for UX. Therefore it is multifaceted and more nuanced than satisfaction alone. As Satisfaction and UX are different constructs it may therefore by possible to obtain high rating on the UES scale but a different rating for overall satisfaction. A system can be useful and efficient, but at the same time displeasurable to use due to other aspects (Chin et al., 1988). Therefore collection of a confirmative Satisfaction metric allowed greater confidence in the later categorisation of viewing session outcomes.

Within Chapter 3, Section 3.4 the emotional foundations of perceptions of satisfaction and it's relationship to affect and valence were discussed. On this basis, tools for the measurement of emotional state and specifically the concept of valence offer a useful method through which to capture a metric for overall satisfaction. Within the methods discussion a number of emotional measurement tools were introduced which attempt to measure valence. This technique has been developed into reliable single scales focused on capturing Satisfaction through self reporting of emotional state against a standardised set of pictograms depicting facial expressions (Benedek & Miner, 2002; Read et al., 2002), and has been used in the context of evaluating video related applications and services (Obrist et al., 2009).

Such a tool was ideal for capturing Satisfaction alongside UES within a survey questionnaire. As the UES is a 32-point scale, the brevity of using a single satisfaction measure whilst retaining reliability was a benefit (Morris, 1995). This prevented the questionnaire becoming too laborious for users to complete. Administering the scales as a questionnaire tool allowed data to be collected in any context, meaning measures could be captured immediately at the point when the experience ends. Following such a protocol attempts to utilise some of the benefits of the ESM technique (see Chapter 3) by reducing memory fade (Csikzentmihalyi, 1975).

Constraining the boundaries for measurement.

In the literature review (see Chapter 2, Section 2.2.4) the boundary of viewing UX was confined to those areas where the consumption device directly supports the experience during viewing. This additionally defined the boundary for UX measurement. The strongest argument for this approach is that the consumption device and associated interactions are the only domain designers can usefully design for as they have no control over other areas of the experience which may occur away from the device in time or space.

Ensuring consistency within the study in terms of content availability across the participants was also an important consideration. Wider access to content across one specific family of devices could considerably bias measurement. Users owning those devices may have rated their experiences more highly due to the additional choices they had in content selection, rather than due to the viewing experiences created. For validity it was therefore important to define the services users accessed during the study in order to create the viewing experiences they would capture. Key considerations to enabling a consistent measure were:

- Comparative content availability across devices and situations.
- Services available on all devices of interest.
- Similarities in costs to access content and services.

Due to these considerations a decision was made to conduct the study using the BBC iPlayer service. iPlayer is the most widely used online video service for broadcast generated content in the UK with an average 10.2 million requests a day (BBC iStats, 2014). It is also the second most accessed online source for video behind only YouTube, (Statista, 2014). BBC iPlayer is also home to many of the UK's most popular shows. It is free at the point of use, and at the time of the study was one of only a few providers that allowed video consumption across smart TVs, set top boxes, computers, mobile devices and games consoles (BBC iPlayer, 2010). This factor meant viewing experiences could be captured in all the contexts of interest.

5.3.2 Participants

Sample size

Considerations of sample size addressed the need to collect enough data to allow within participant comparisons of ratings across different Viewing Archetypes. An assumption was made that each user could reasonably capture three full examples of their viewing during a one-week study period. As the goal of the study was to capture natural viewing experiences it was important not to prescribe the situations to watch in. However enough data needed to be collected to allow a robust analysis.

A conservative estimate was made which assumed that from each user's set of three sessions at least one comparison of viewing across different situations would be possible, (i.e. not all sessions from the user would be captured in the same Viewing Archetype). For the study as a whole, a sample size of forty participants would therefore allow a minimum of forty comparisons in total. Capture of sessions with coverage across the Viewing Archetypes was achieved by recruitment of users reporting viewing behaviours of interest.

Participant recruitment, screening and retention.

Participants were recruited from the general public through a specialised professional recruitment agency. The possible risks to validity raised by constraining users to the use of BBC iPlayer were ameliorated by recruiting people who used the service on a regular basis as part of the their normal viewing routines. In this way, the viewing captured represented natural viewing behaviours. A screening questionnaire was used to ascertain users' reported viewing patterns and behaviour. This process maximised the possibility of capturing insight from across the Viewing Archetypes. Fundamental screening considerations across the group were:

- Access to and consumption of content from BBC iPlayer.
- Reported evidence of both solitary and shared viewing.
- Use of a mobile device of any kind to watch video.
- Frequency of use.

The screening brief provided to the recruiter is reproduced in Appendix H, Section 10.8. Each participant was paid an incentive of £120 to cover personal expenses. Retention was encouraged through staged payment with users receiving half during the initial kick-off workshop and the other half on return of the data, camera equipment and attendance of the exit group interview. All users were retained during the study though there were some instances of missing or incomplete data. These are described in more detail in the results.

The Recruited Sample.

A high level summary of the user demographics for the sample recruited for the study is provided in Table 5.1. Total sample size was n=40 consisting of 21 males and 19 females. Ages ranged from 18 to 64 *(M=38, SD=14).* A further detailed breakdown of participants by age is shown in Figure 5.2.

The graph in Figure 5.3 depicts the two devices users reported in the screening questionnaire as being used most often for video consumption, (again broken down by age).

Total sample size	40
Age	Ranging from 18 to 64
Gender	21-Male 19-Female
Living in households with others	40
Regularly watch video content on a big screen TV at home via a set top box	29
Regularly watch video content on a mobile device	18
Regularly watch video via a games Console.	7
Regularly watch video content on a PC (desk or laptop)	25
Has watched video content on a device outside the home in last month	23

Table 5.1. Summary of user demographics.

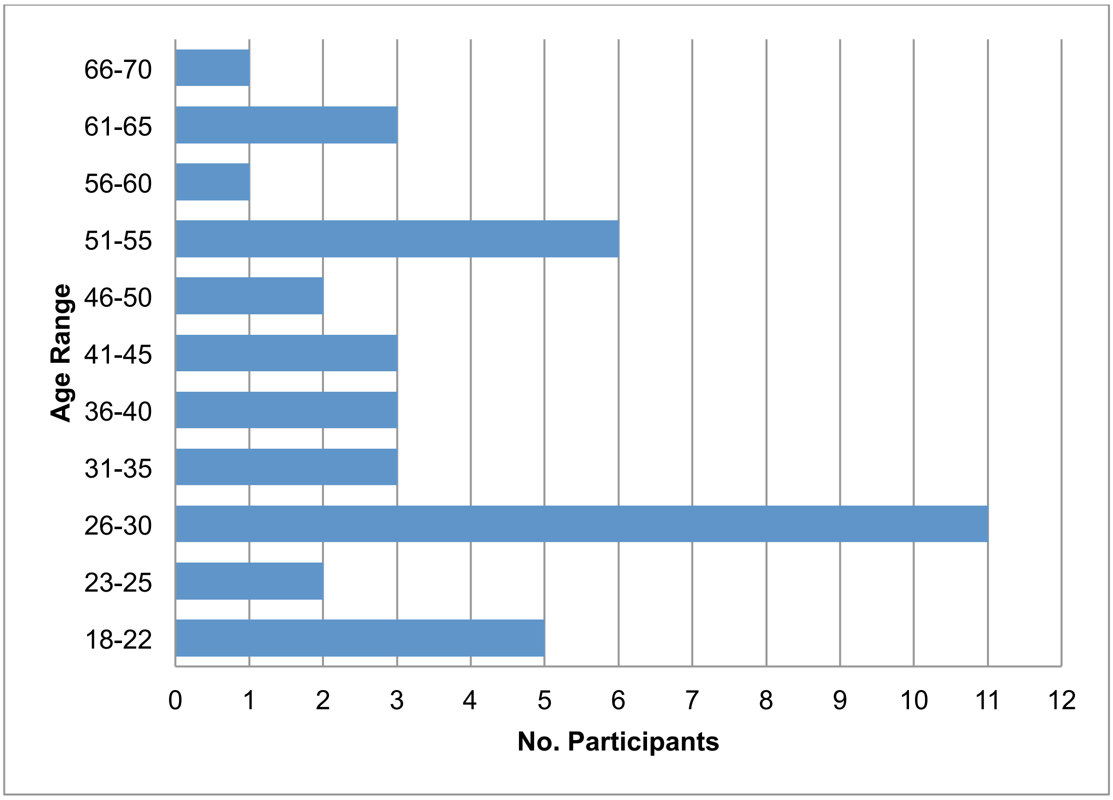


Figure 5.2. Participant sample by age distribution.

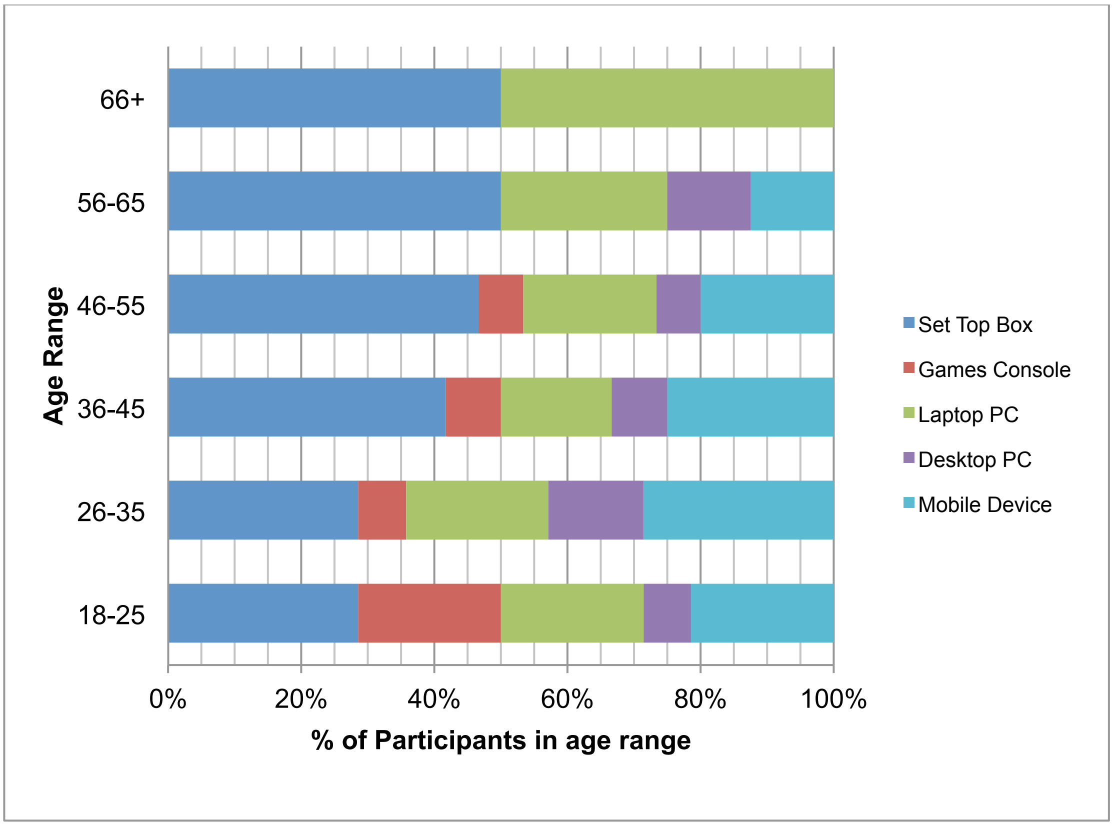


Figure 5.3. Reported “top two” devices used most often for video consumption.

5.3.3 Procedure

Due to equipment availability and group size considerations for entry and exit sessions the total sample was split into five groups of eight. Two phases of two groups ran in parallel during the study period with a gap of a few days between phase one and two. A final group was recruited some weeks after in an attempt to provide full coverage across the Viewing Archetypes.

The procedure followed three distinct phases. Each participant group were first brought together in a kick off introductory workshop to introduce them to the study and distribute study equipment. Participants then collected self-reported data related to any three of their natural viewing experiences over a one-week period. This was achieved using a wearable camera worn through the experience and by completing a two-part questionnaire immediately afterwards. The scales used in the questionnaire are noted in Table 5.2.

Tool	Measure	Details
UES (O'Brien & Toms, 2008)	Captures responses to 6 individual components of experience that the authors describe as 'Engagement' when reported as a collective measure.	32 question scale. Subscales in the individual areas of: Novelty; Perceived Usability; Endurability; Focused Attention; Felt Involvement; Aesthetics
Valence emotion scale, (Read et al., 2002)	Captures responses for emotional valence, which was used as a proxy for Satisfaction.	1 question, using a 5-point scale.

Table 5.2. Survey scales used within Study 2, part 1.

Participants were then brought back together in a debrief focus group to discuss their experiences over the study period and return the data. An outline of all the study steps is provided in Table 5.3.

Activity	Description
Participant recruitment	• Screening based on reported viewing behaviours. • Capture demographics and technology usage.
Introductory workshop	• Introduction to the study. • Equipment and study materials distributed.
User captures situated questionnaire data.	• User provides responses to at least 3 viewing sessions during the week using the tools documented in Table 5.2.
User captures self-recorded video. (Chapter 6 Study 2, part 2).	• User captures video of the same 3 viewing sessions as above using a wearable camera.
Feedback session and group interview.	• After one week the user returns the equipment and study data. • Users explore their experiences over the previous week and confirm the detail of the sessions they captured.

Table 5.3. Outline design for Study 2, part 1.

Observational data collected on camera used a modified form of self-captured video in an attempt to overcome some of the issues encountered in Study 1. Modifications included replacing the camera technology for an easier of operate, miniature wearable camera (Muvi Pro Micro DV) instead of using a handheld model. In all cases modifications to the approach were tailored to the aims of the study, built on lessons learnt from Study 1 and piloted by the researcher before use in this study. These considerations are described in detail in the study design section within Chapter 6 (Study 2, part 2).

Unless otherwise noted protocols for the methodologies used followed the descriptions in Chapter 3. The author was responsible for all research activities and data analysis. As the study focused on BBC iPlayer the BBC paid recruitment costs and participant incentives in exchange for sharing of anonymised findings (with participant consent) at the end of the study.

Data analysis.

Data from the paper questionnaires was transferred to a spreadsheet. An initial coding of all the data was then made to link questionnaire data back to an individual user's screened profile. The participant's captured video data was used in conjunction with exit interview data to verify the reported Viewing Archetypes. 100 sessions were captured on video and of these 96 were successfully classified. Cues coded from the videos at this point to ascertain Archetype are noted in Table 5.4.

Coding Construct	Categories / Code
Watching alone or with others.	W1. ALONE W2. WITH OTHERS
Presence of secondary devices in the viewing situation.	S1. IN USE S2. NOT BEING USED
Privacy level of viewing situation.	P1. IN HOME P2. AWAY
Consumption device.	D1. SET TOP BOX D2. GAMES CONSOLE D3. MOBILE DEVICE D4. LAPTOP D5. DESKTOP
Indication of Time of day (from video time stamp).	T1. WEEKDAY (until 4pm) T2. WEEKDAY PM (until 7pm) T3. WEEKDAY EVENING (after 7pm) T4. WEEKEND (until 4pm) T5. WEEKEND PM (until 7pm) T6. WEEKEND EVENING (after 7pm)

Table 5.4. Coding used to verify the Viewing Archetype from video.

Once coded, the survey data was investigated in Microsoft Excel. Descriptive statistics and analysis for responses to UES and Satisfaction were carried out using the StatPlus statistical plugin for Excel[3], and the Real-Statistics supplemental functions and data analysis pack for Excel[4].

5.3.4 Study Materials

The screening questionnaire used to recruit participants is reproduced in Appendix H, Section 10.8.

The survey questionnaire is reproduced in Appendix G, Section 10.7.

The specification of the camera used is provided in Appendix I, Section 10.9

The stimulus used in the entry and exit sessions is reproduced in Appendix J, Section 10.10.

[3] www.analystsoft.com/en/products/statplus/

[4] www.real-statistics.com

5.4 Results

5.4.1 Overview of the data capture.

A complete set of 120 questionnaires was returned, however four had significant amounts of missing data. Three users did not return any video at all due to technical issues. In addition other users returned less than the three video examples requested due to various reasons including lifestyle clashes and user error when attempting to record. These omissions resulted in a total of 100 complete video examples and 96 complete data sets (questionnaire and video).

Users consumed content on a number of different devices in various settings. A high level breakdown of device usage is provided in Figure 5.4, whilst Figure 5.5 provides an overview of the physical settings. A summary of the consumption devices utilised by participants when watching within particular Viewing Archetypes is shown in Figure 5.6. As documented in Chapter 4 these were:

1. 'Quality Time' the lean back experience of prime time viewing in the home with friends and family.

2. 'Self indulgence' opportunist acts of relaxing alone at home in order to watch content of particular personal interest.

3. 'Opportunist planning' snatching the opportunity to watch content on mobile devices in non-private waiting situations, down time or when commuting.

4. 'Sharing space but not content' the act of sharing a private space with another family member or friend whilst not sharing content.

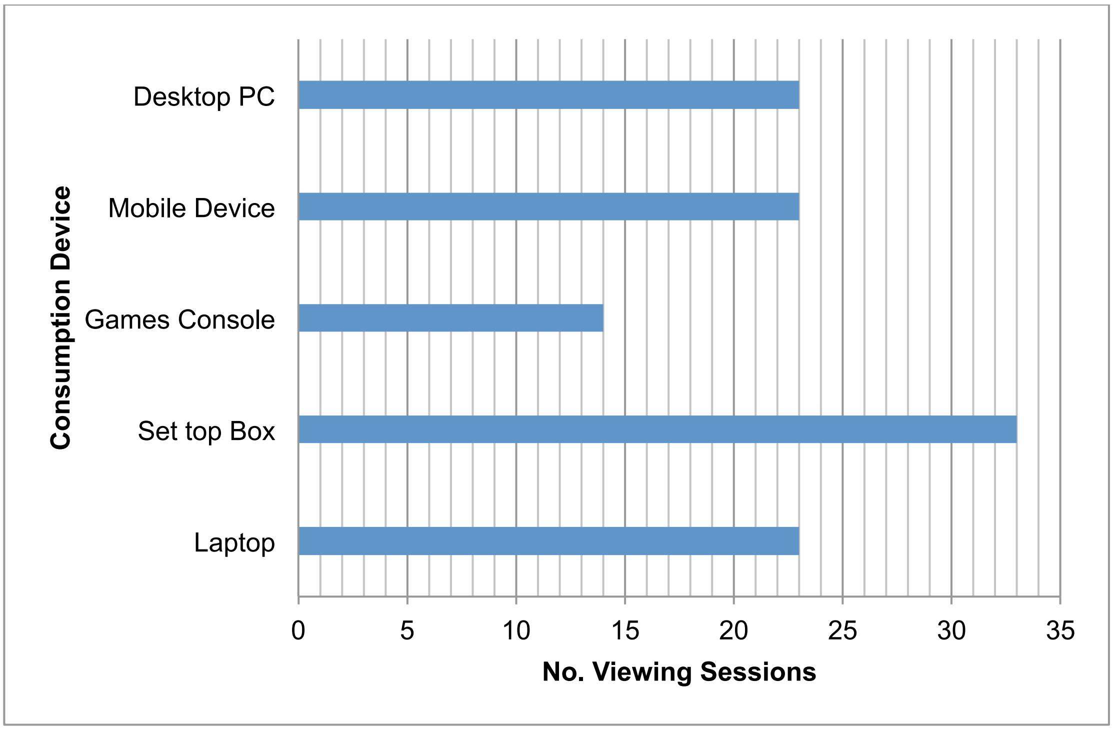


Figure 5.4. Frequency of response by device – all participants.

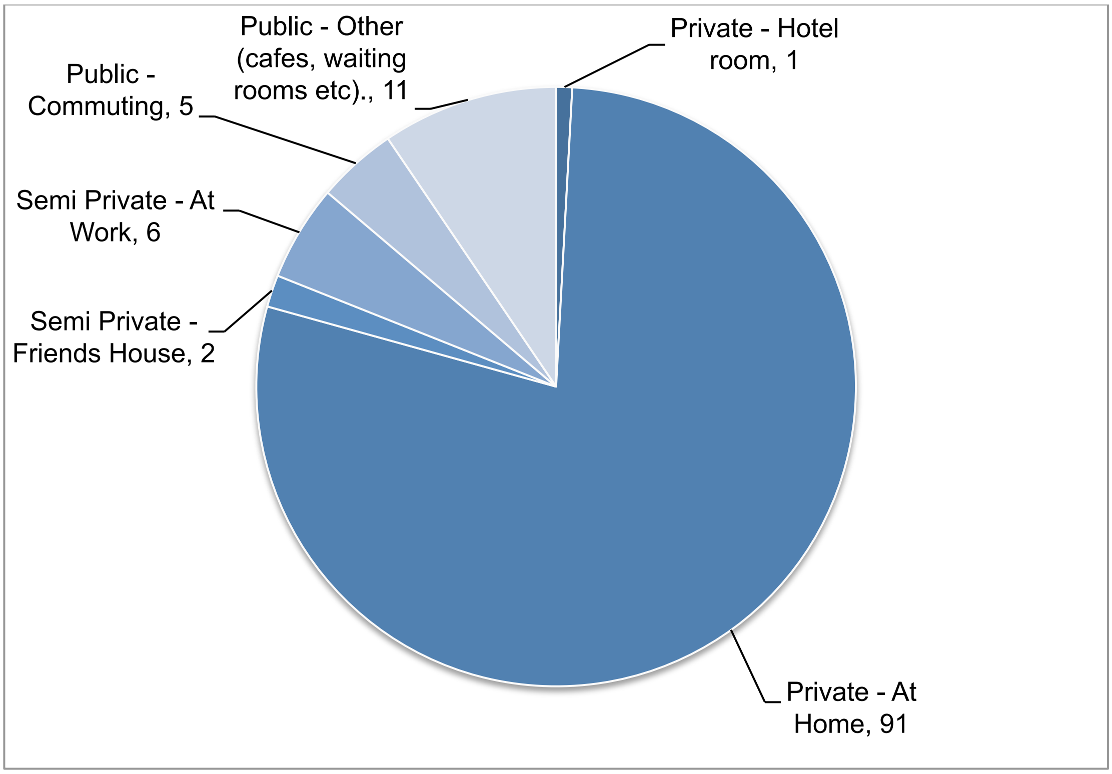


Figure 5.5. Frequency of response by physical setting – all participants.

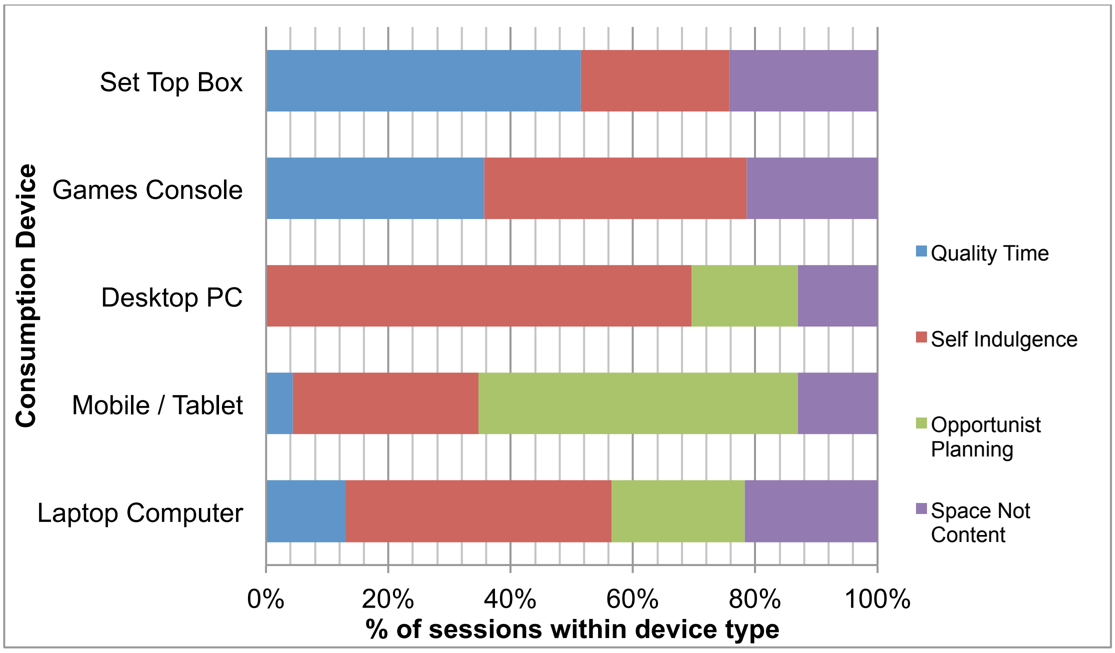


Figure 5.6. Frequency of device use in different Viewing Archetypes. (Metric expressed as a percentage of total sessions on a given device).

The graph in Figure 5.7 depicts the frequency of sessions captured on video as a total of all responses collected from within each Viewing Archetype.

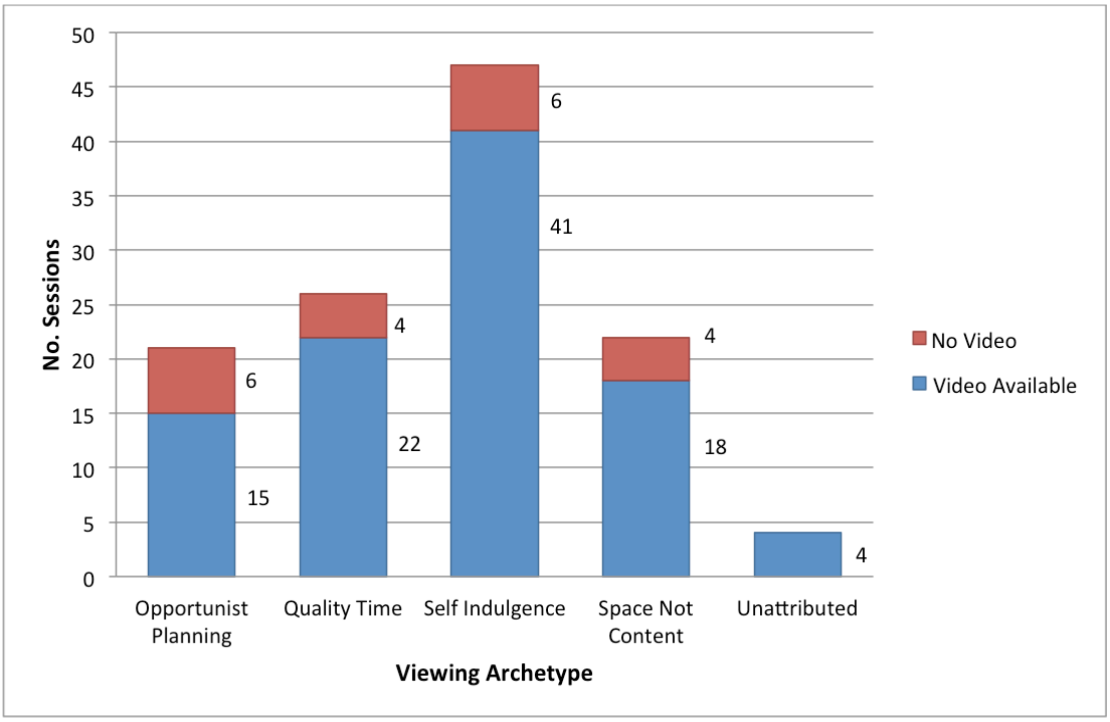


Figure 5.7. Frequency of sessions captured on video (by Viewing Archetype).

5.4.2 Evaluation of the UES scale measurement method.

The first analysis was an evaluation of the reliability of the survey scale. The inter-item reliability of questions was computed for each subscale of the UES. Subscales are defined as the components of experience measured by the UES in O'Brien and Toms (2010a). For reference these were; Novelty (NO), Perceived Usability (PU), Aesthetics (AE), Focused Attention (FA), Endurability (EN) and Felt Involvement (FI).

The reliability analysis used Cronbach's Alpha, and targeted alpha levels above 0.7 (Santos, 1999). The analysis showed unacceptable levels of internal consistency within two of the subscales; Aesthetics *(α=0.57, M=2.29, SD=0.63)* and Novelty *(α=0.42, M=2.97, SD=0.83)*. Correlations between subscale items were then carried out using Pearson's *R*. Correlations were found between most subscales items. This was not unexpected based on O'Brien and Toms (2008), as items investigated during development of the scale had shown some loading across different factors. This could be expected when attempting to identify and measure the individual factors of a holistic concept such as UX. However in this study a strong correlation strength (over 0.5) was identified between a number of the subscale items, (NO-PU=0.68, NO-AE=0.57, NO-EN=0.51, NO-FA=0.53, PU-EN=0.64, PU-FA=0.56 and EN-FA=0.51). This suggests there may be survey questions within those subscales that load onto more than one subscale factor.

On the basis of these findings a further investigation was made using factor extraction to understand the underlying relationships between factors within the scale. High levels of factor loading from different subscales were found and a visual investigation of a scree plot of eigenvalues suggested a three or four factor solution explained the majority of internal variance. These findings indicate that in the context of viewing experience the UES was not measuring six dimensions of experience as envisaged by O'Brien and Toms. Details of all the statistical analysis and discussion in this section can be found in Appendix

K, Section 10.11. Due to these issues the author did not believe it was valid to report the UES survey responses in the study as separate dimensions of experience. However when treated as a uni-dimensional entity, overall engagement responses on the UES offered excellent internal consistency *(α=0.95, M=2.96, SD=0.48).*

5.4.3 Relating UX measured on the UES to User Satisfaction.

An analysis was undertaken to understand the correlation between the UES as a uni-dimensional tool and the measure of satisfaction that was also collected. Whilst the data from the UES was normally distributed the ratings from satisfaction were not (Shapiro-Wilk W p>.05). This inferred a non-parametric approach to analysis. Table 5.5 provides summary statistics for satisfaction, UES and the results of the correlation analysis conducted between the two measures using Spearman's *R*.

Indexes	**Mean**	**Standard Deviation**	**Shapiro-Wilk W**	***p***	**r_s UES v SAT**
Overall UES	2.96	0.48	0.984	0.345	**0.63***
Satisfaction	3.50	1.11	**0.873**	**0.001***	

*Table 5.5. Summary analysis of descriptive statistics and correlations between Satisfaction and UES. *Significant at <0.01.*

This analysis showed a statistically significant positive correlation between reported satisfaction and UES. The correlation was relatively strong (0.63) indicating a linear relationship existed between the two measures.

5.4.4 Investigating UX based on Viewing Archetype

Results for Satisfaction by Archetype

The boxplot in Figure 5.8 depicts the variation in satisfaction ratings by Viewing Archetype across the whole sample. As most users had captured numerous responses across more than one viewing situation it was additionally possible to conduct a within subjects comparison of satisfaction across those viewing sessions. This was carried out to understand how user ratings changed between viewing contexts.

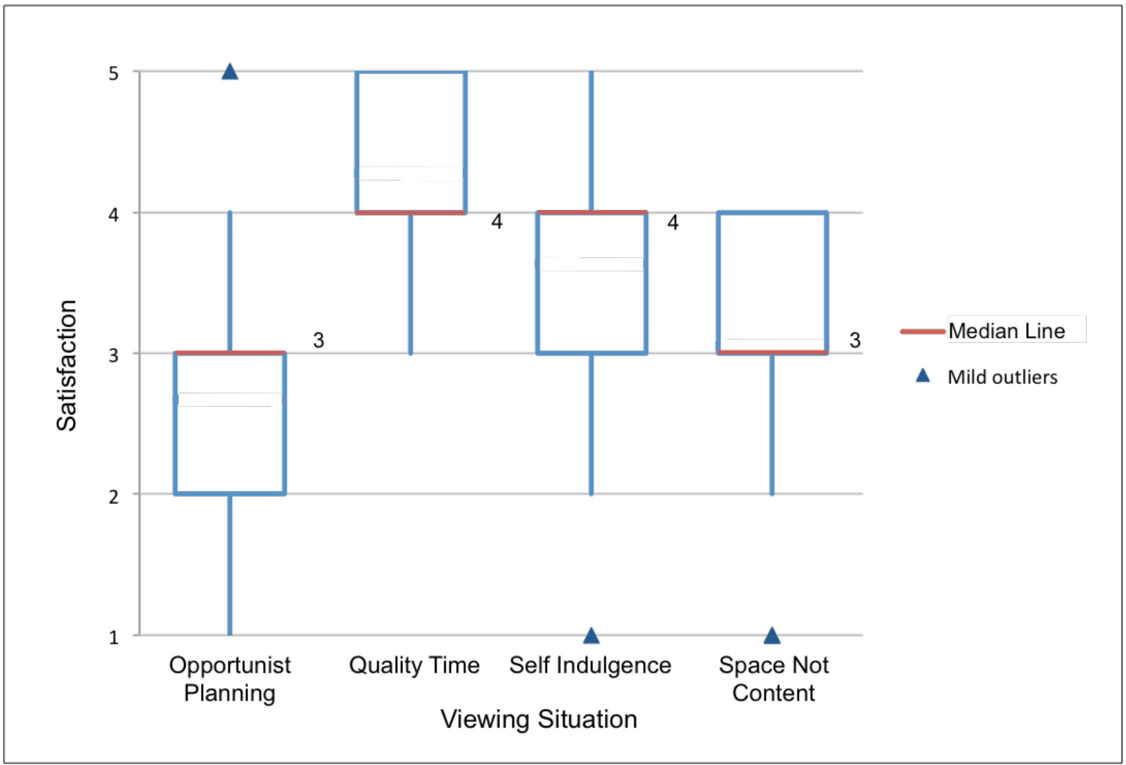


Figure 5.8. Boxplot of satisfaction responses by Viewing Archetype. Whole sample.

A non-parametric approach to analysis was utilised due to the fact that satisfaction responses could not be assumed to be normally distributed. As suggested by Coolican (2004) within subjects Wilcoxon Sign ranked tests were used to measure the differences between the two related data sets due to the small sample sizes. This would allow the calculation of z values and two tailed probabilities, as W becomes a close approximation to the normal distribution at sample sizes of 10 and above. Additionally W can still provide significance through lookup tables of critical values down to samples sizes of five (Lowry, 1998). Holm's (1979) sequential Bonferroni adjusted alpha levels were calculated to maintain the family-wise type I error at a desired alpha level of 0.05. Adjusted critical values for *p* are represented throughout. Table 5.6 provides a high level summary of the analysis results. Figure 5.9 provides boxplots of the within subject comparisons.

This analysis showed satisfaction responses were lower to a statistically significant level in Opportunist Planning Archetype situations when compared to both Quality Time and Self Indulgence. The differences in ratings for Quality Time were additionally higher to a statistically significant level in comparison to Space Not Content.

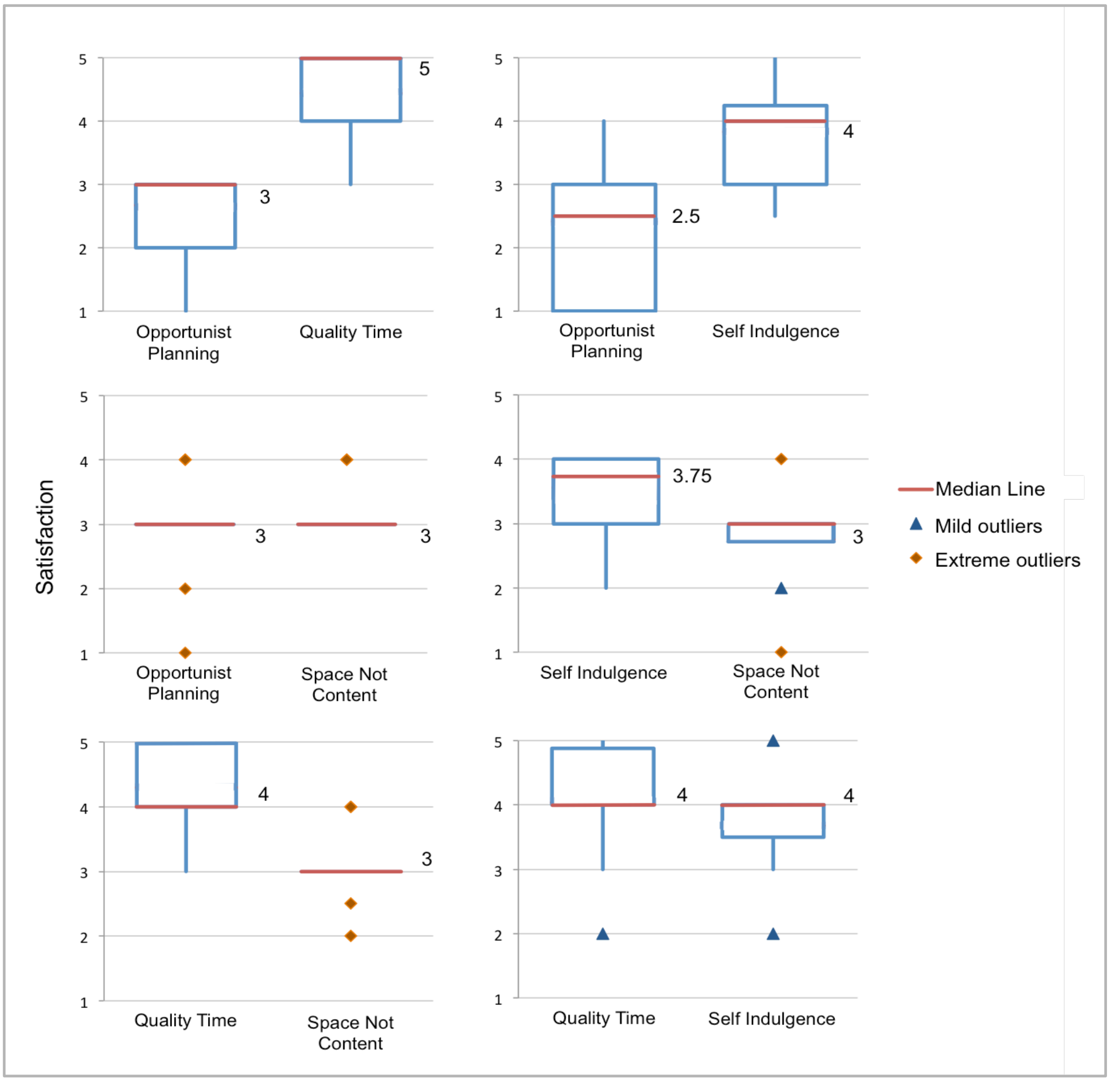


Figure 5.9. Boxplot matrix of satisfaction responses by Viewing Archetype. Within subject comparisons.

Situation A	Situation B	*n*	*z*	*W* *(nRanks)*	*P* *(P crit)*	Effect Size PS_{dep}
Quality Time	Space Not Content	10	*-2.803*	*0(10)*	***0.0051**** *(0.0083)*	1.0
Opportunist Planning	Self Indulgence	12	*-2.599*	*2(10)*	***0.0093**** *(0.01)*	0.9
Opportunist Planning	Quality Time	10	-	*0(8)*	≤ ***0.01**** *(0.0125)*	1.0
Self Indulgence	Space Not Content	8	-	*5(7)*	*> 0.05* *(0.0167)*	-
Quality Time	Self Indulgence	14	*-1.172*	*16(10)*	*0.2411* *(0.025)*	-
Opportunist Planning	Space Not Content	9	-	*1(3)*	*> 0.05* *(0.05)*	-

*Table 5.6. Summary comparison of satisfaction ratings by Viewing Archetype. Z values reported where nRanks= ≥10 else P from critical values of W. Critical values for P based on sequential Bonferroni adjusted alpha levels in parentheses. *Significance (family-wise α <0.05).*

Results for UES by Archetype

Figure 5.10 depicts the variation in overall UES responses by Viewing Archetype. Again as users captured numerous responses across more than one viewing situation it was possible to compare UES ratings within participants across the viewing contexts in which they had watched. Whilst the UES responses were shown to be normal across the whole sample, the small samples sizes used in the within participant comparisons of UES across Viewing Archetypes were not. Therefore the same non-parametric approach to analysis was applied as was used to investigate satisfaction.

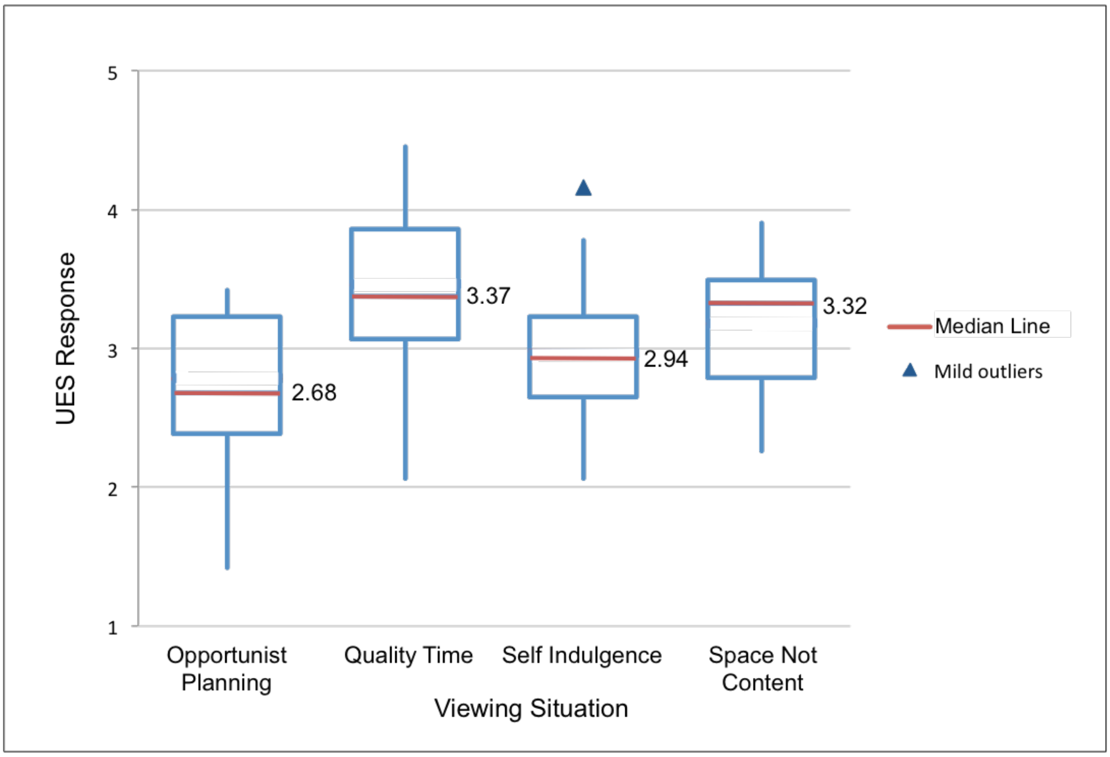


Figure 5.10. Boxplot of UES responses by Viewing Archetype. Whole sample.

Figure 5.11 provides boxplots of the within subjects comparisons. Table 5.7 provides a summary of the statistical analysis conducted using Wilcoxon matched pair signed rank tests with Holm's sequential Bonferroni adjusted alpha levels.

This analysis mirrored the findings for satisfaction. UES ratings for Opportunist Planning were lower in comparison to all other situations. The difference in ratings between Quality Time and Opportunist Planning were statistically significant. UES ratings were also significantly higher in Quality Time situations in comparisons to Space Not Content Archetype sessions.

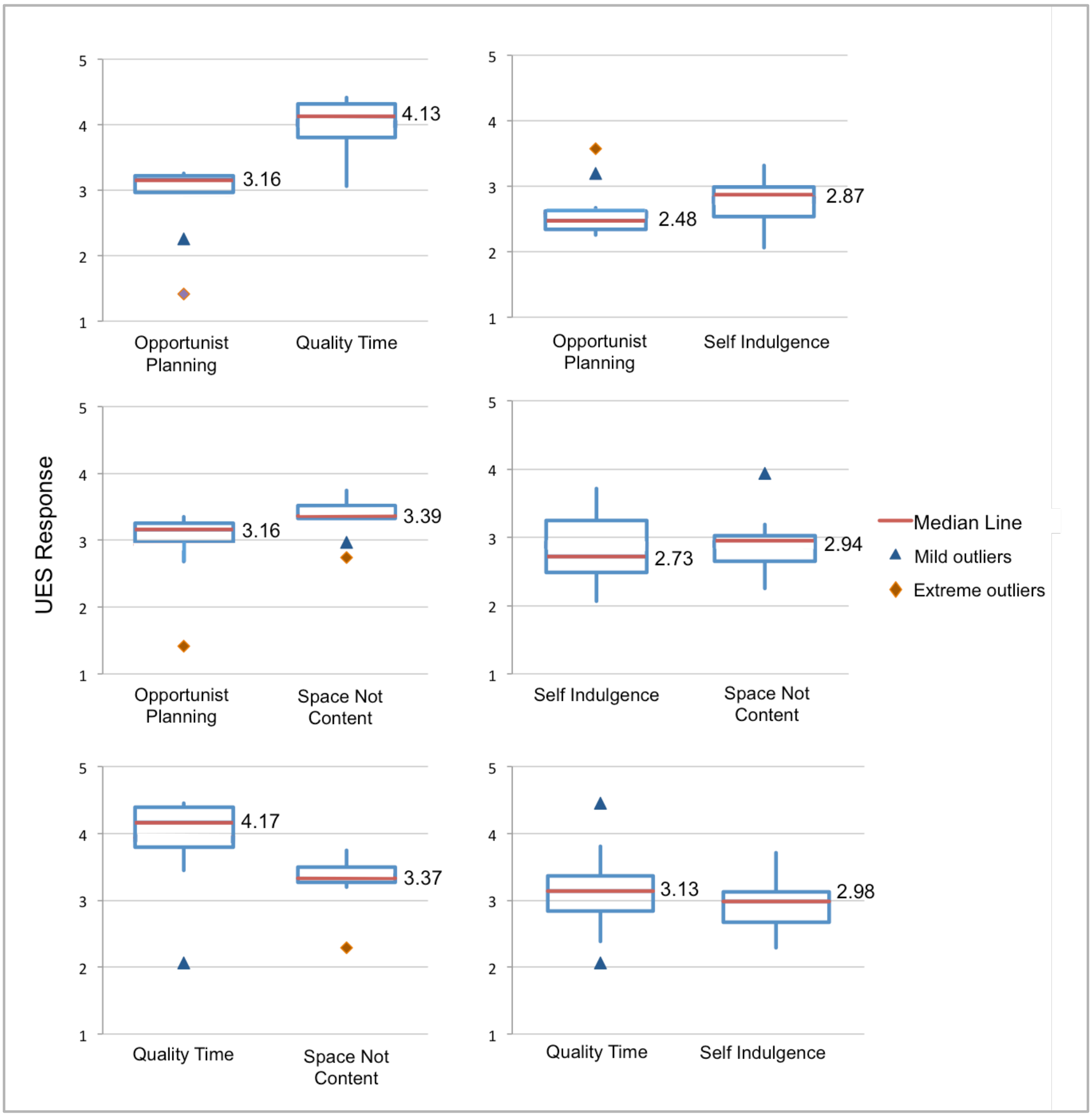


Figure 5.11. Boxplot matrix of UES responses by Viewing Archetype. Within subject comparisons.

Situation A	Situation B	*n*	*z*	*W (nRanks)*	*P (P crit)*	Effect Size PS_{dep}
Opportunist Planning	Quality Time	10	*-2.803*	*0(10)*	***0.0051**** *(0.0083)*	1.0
Quality Time	Space Not Content	10	*-2.599*	*2(10)*	***0.0093**** *(0.01)*	0.9
Opportunist Planning	Space Not Content	9	-	*6.5(9)*	*> 0.05* *(0.0125)*	-
Opportunist Planning	Self Indulgence	12	*-1.372*	*21.5(12)*	*0.1707* *(0.0167)*	-
Quality Time	Self Indulgence	14	*-0.973*	*37(14)*	*0.332* *(0.025)*	-
Self Indulgence	Space Not Content	8	-	*13(7)*	*> 0.05* *(0.05)*	-

*Table 5.7. Summary comparison of UES responses by Viewing Archetype. Z values reported where nRanks= ≥10 else P from critical values of W. Critical values for P based on sequential Bonferroni adjusted alpha levels in parentheses. *Significance (family-wise α <0.05).*

5.4.5 Investigating other factors that could impact UX.

Other possible factors that could impact the measured quality of UX were additionally considered in order to compare and contrast to the differences in ratings seen when session ratings were analysed by Archetype.

Results for Satisfaction and UES by Device Use

The boxplots in Figure 5.12 and Figure 5.13 depict satisfaction and UES ratings by use of consumption device. Again as users provided numerous survey responses across different devices, (see Figure 5.4) it was possible in cases where the user had utilised more than one device to compare both UES and satisfaction within participants across devices used. Due to the tendency of individual users to access content only from one or two favoured devices this analysis was restricted to only three comparisons due to the data available. Table 5.8 (for satisfaction) and Table 5.9 (for UES) provide summaries of the analysis, which again were conducted using Wilcoxon matched pair signed rank tests with Holm's sequential Bonferroni adjusted alpha levels.

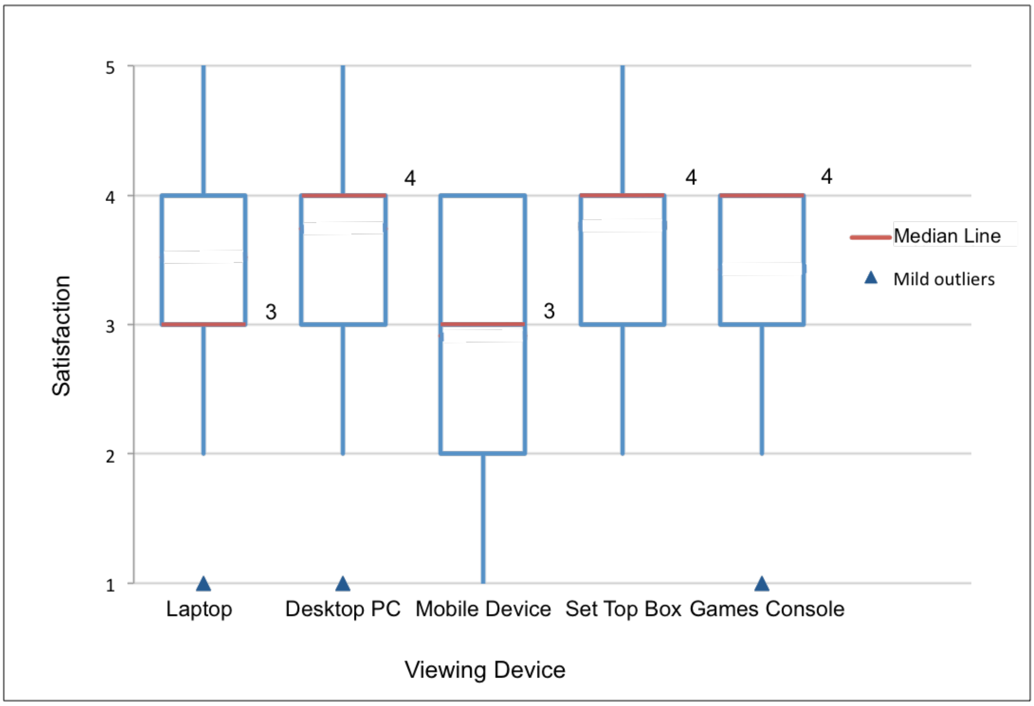


Figure 5.12. Boxplot matrix of satisfaction responses by viewing device. Whole sample.

Device A	**Device B**	***n***	***z***	***W* (*nRanks*)**	***P* (*P crit*)**	**Effect Size *PS_dep***
Laptop PC	Set Top Box	11	-	*14(9)*	*> 0.05 (0.0083)*	-
Set Top Box	Mobile Device	6	-	*6(9)*	*> 0.05 (0.01)*	-
Desktop PC	Mobile Device	7	-	*8.5(6)*	*> 0.05 (0.0125)*	-

*Table 5.8. Summary comparison of satisfaction responses by viewing device. Z values reported where nRanks= ≥10 else P from critical values of W. Critical values for P based on sequential Bonferroni adjusted alpha levels in parentheses. *Significance (family-wise α <0.05).*

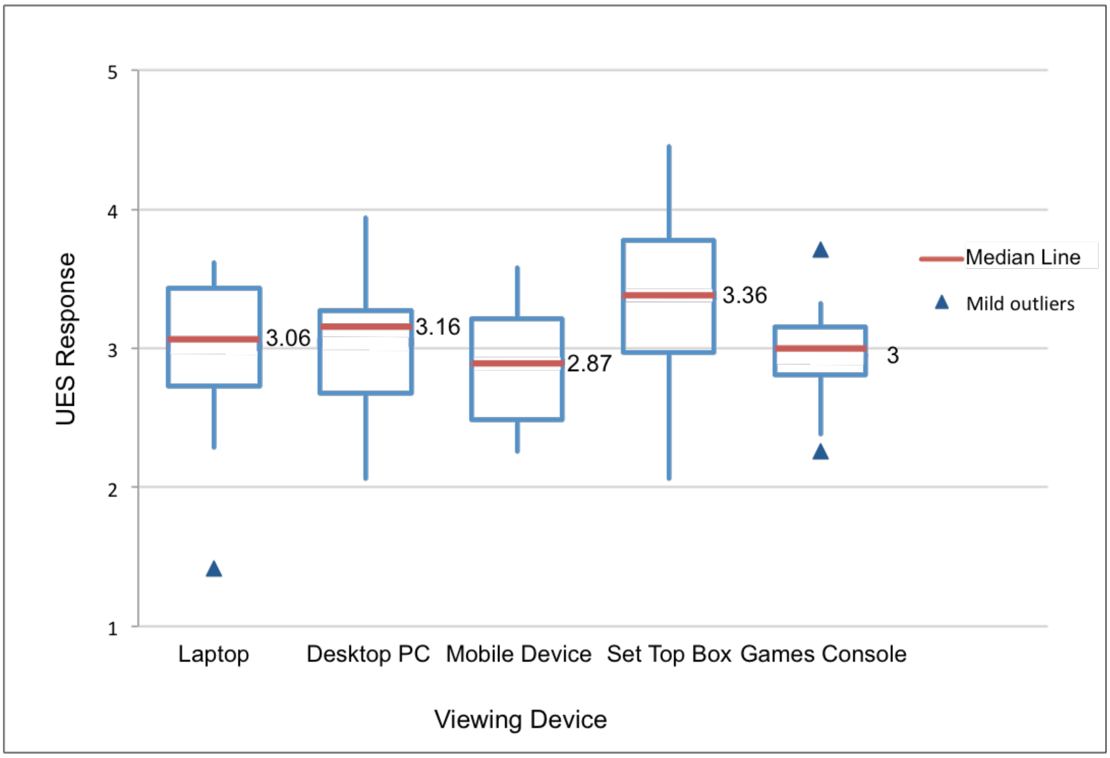


Figure 5.13. Boxplot matrix of UES responses by viewing device. Whole sample.

Device A	**Device B**	***n***	***z***	***W* (*nRanks*)**	***P* (*P crit*)**	**Effect Size PS_{dep}**
Laptop PC	Set Top Box	11	*-2.044*	*10(11)*	*0.0408 (0.0083)*	-
Set Top Box	Mobile Device	6	-	*2(6)*	*> 0.05 (0.01)*	-
Desktop PC	Mobile Device	7	-	*10(7)*	*> 0.05 (0.0125)*	-

*Table 5.9. Summary comparison of UES responses by viewing device. Z values reported where nRanks= ≥10 else P from critical values of W. Critical values for P based on sequential Bonferroni adjusted alpha levels in parentheses. *Significance (family-wise α <0.05).*

This analysis showed that although Set Top Box viewing attracted marginally higher ratings than the other devices (and mobile devices marginally lower ratings) for both satisfaction and UES, the differences in ratings were not statistically significant.

A further visual analysis was conducted using bubble plots (Figure 5.14 and Figure 5.15) which indicated that both satisfaction and UES varied more with changes in Viewing Archetype than with changes in consumption device.

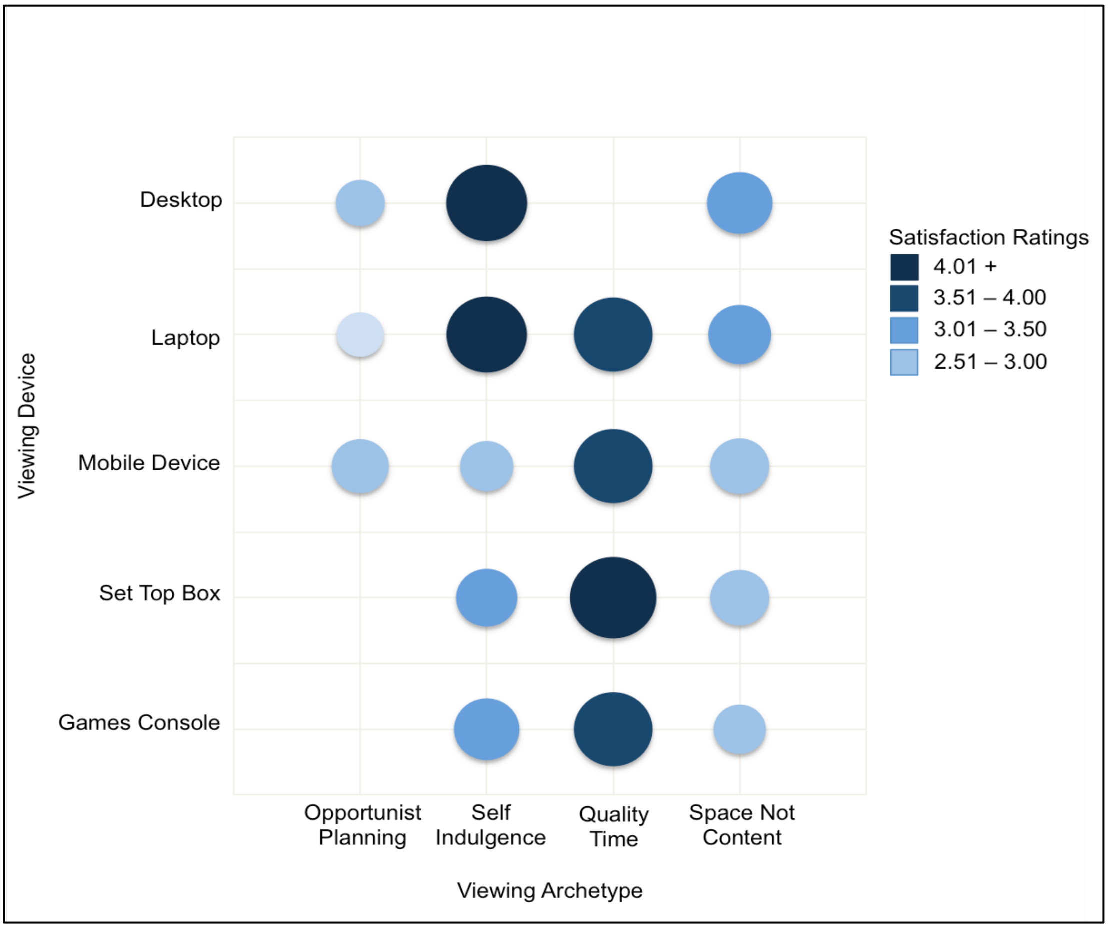


Figure 5.14. Bubble plot of satisfaction responses. Viewing device versus Viewing Archetype.

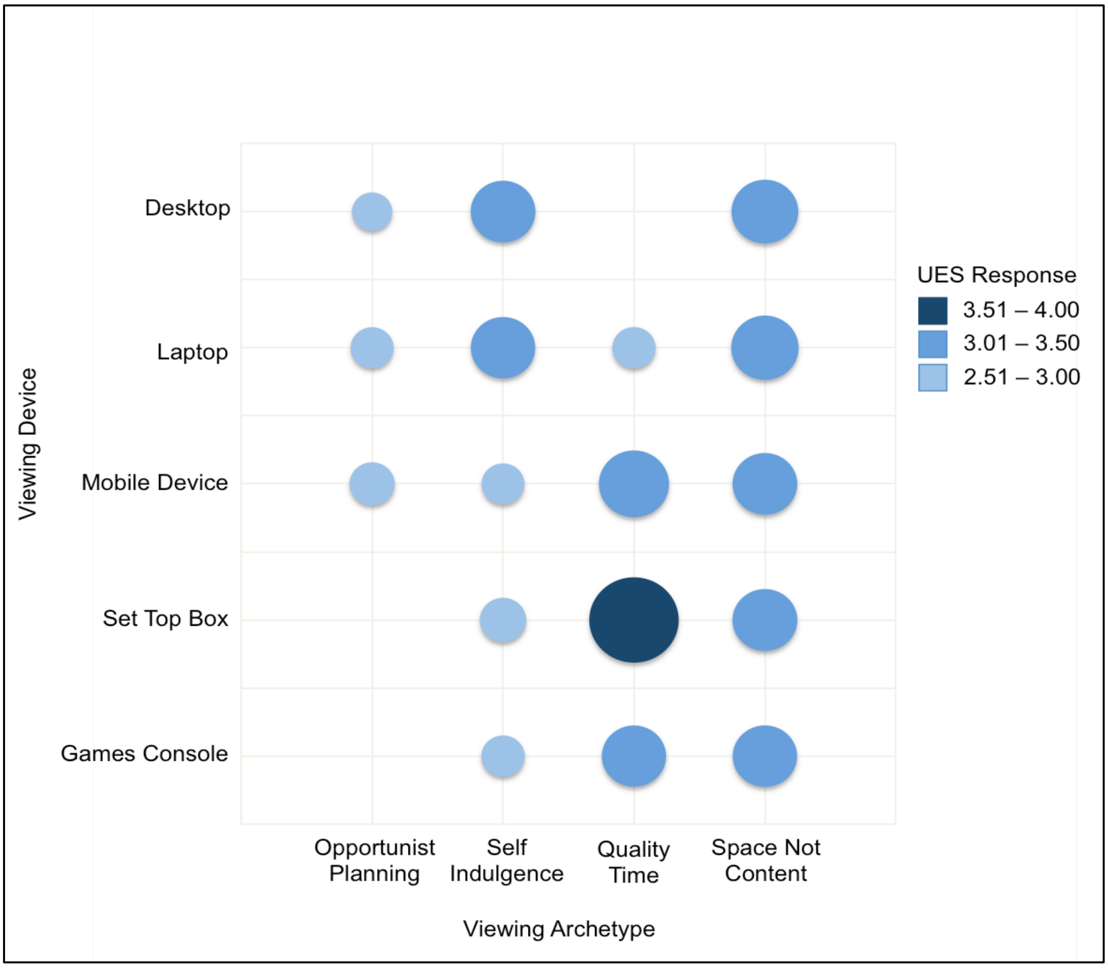


Figure 5.15. Bubble plot of UES responses. Viewing device versus Viewing Archetype.

Direct comparison of mobile device to set top box experiences.

The finding in section 5.4.5 merited further investigation. Finding no statistically significant differences in user ratings for either satisfaction or UES between any consumption devices used during the study was an unexpected result. A further post hoc analysis was therefore attempted to eliminate the variable of Viewing Archetype from the comparison. However Self Indulgence situations in the home was the only viewing situation with examples of viewing both on mobile devices and through set top boxes. Unfortunately not enough within participant examples of viewing existed in the dataset to allow a related sample statistical investigation. However as an indicative indication of the data collected, all examples were plotted in boxplots. Figure 5.16 and Figure 5.17 support the results from the statistical studies in Table 5.8 and Table 5.9. The differences seen in ratings for satisfaction and UES between devices (even when attempting to account for situation) were comparable only to the random variation seen across the data set as a whole.

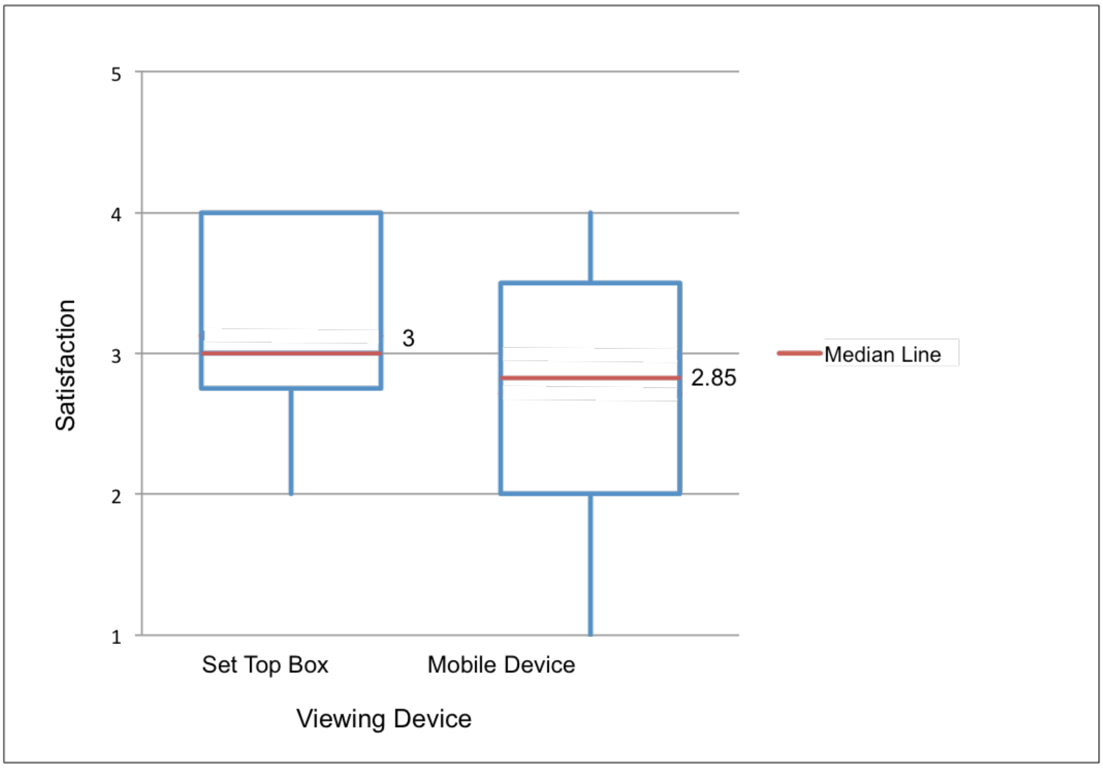


Figure 5.16. Boxplot of satisfaction responses in Self Indulgence Viewing Archetype. Set top box versus Mobile Device.

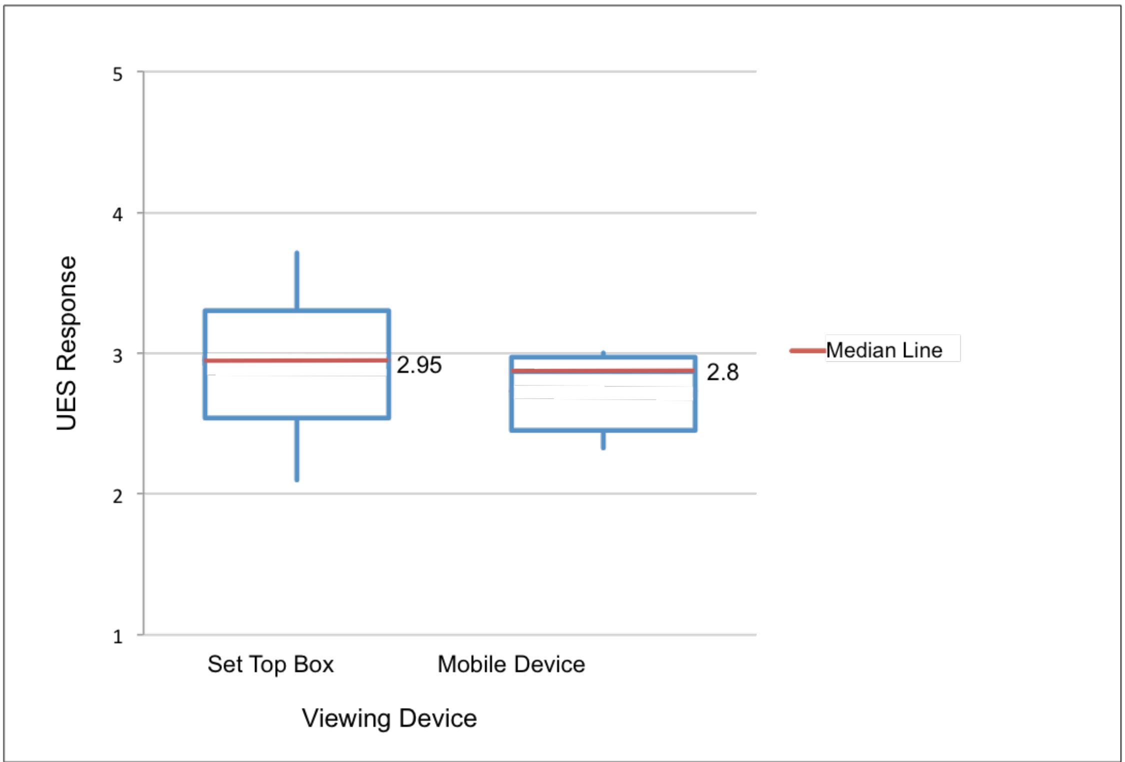


Figure 5.17. Boxplot of UES responses in Self Indulgence Viewing Archetype. Set top box versus Mobile Device.

Results for Satisfaction and UES by Viewing Location.

The boxplot in Figure 5.18 depicts satisfaction responses reported in viewing sessions categorised as either occurring at home, or away from home in other environments. Figure 5.19 offers a similar presentation for UES responses. Again as users captured numerous responses across different situations in some cases it was possible to compare both satisfaction and UES ratings within participants across locations. Table 5.10 and Table 5.11 provide summaries of the analysis that could be conducted for both satisfaction and UES.

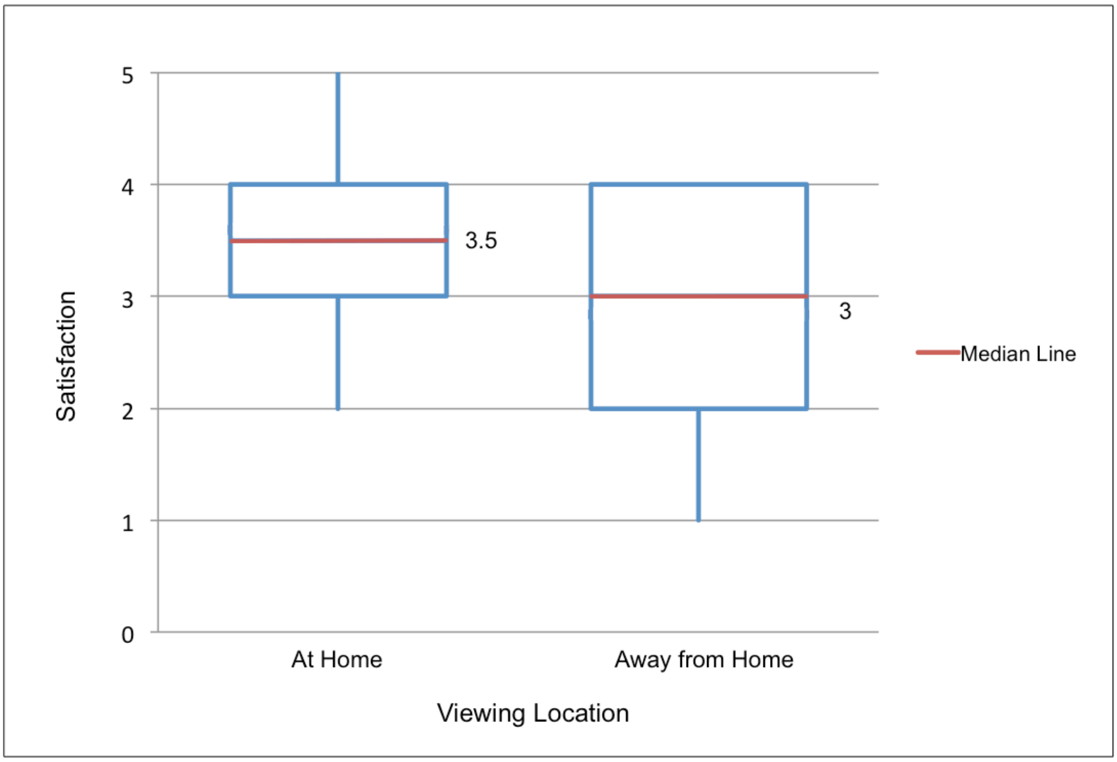


Figure 5.18. Boxplot of Satisfaction responses by viewing location.

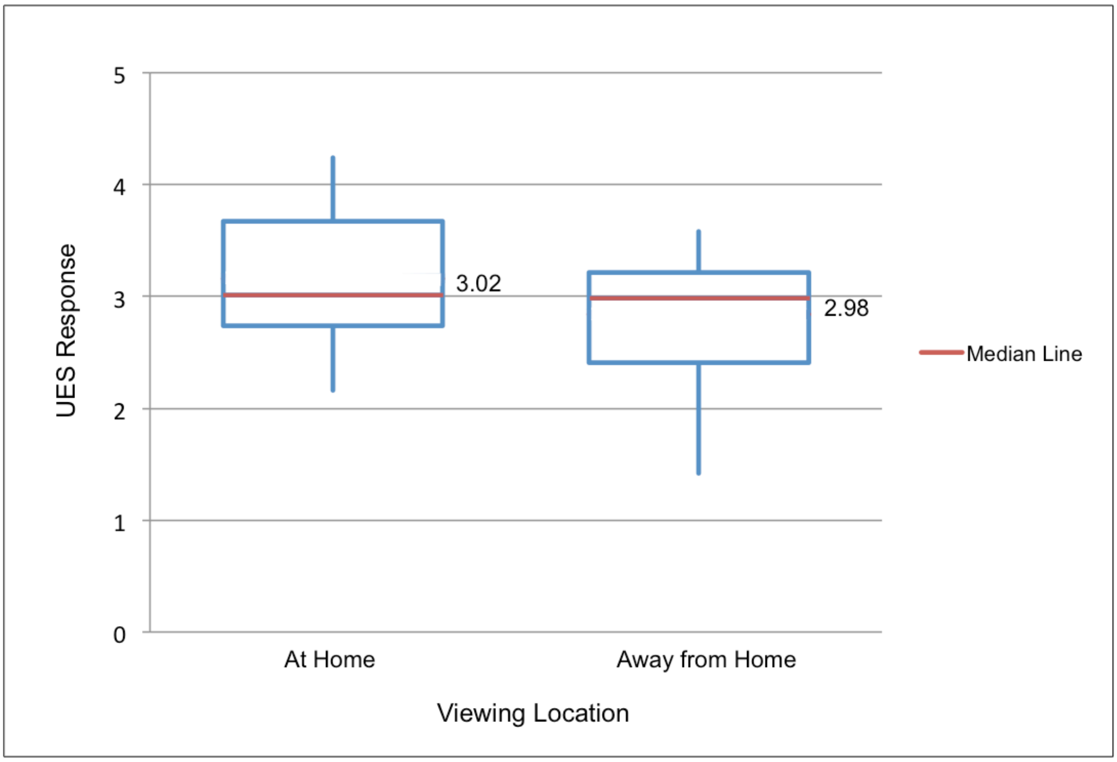


Figure 5.19. Boxplot of UES responses by viewing location.

Location A	Location B	*n*	*z*	*W (nRanks)*	*P*	Effect Size PS_{dep}
At Home	Away from home	22	*-2.259*	*50.5(21)*	***0.0238****	-

Table 5.10. Summary comparison of Satisfaction responses by viewing location. Z values reported where nRanks= ≥10 else P from critical values of W.

Location A	Location B	*n*	*z*	*W (nRanks)*	*P*	Effect Size PS_{dep}
At Home	Away from home	22	*-1.866*	*69(22)*	*0.0614*	-

Table 5.11. Summary comparison of UES responses by viewing location. Z values reported where nRanks= ≥10 else P from critical values of W.

This analysis showed a statistically significant difference in the ratings for satisfaction with viewing at home, attracting higher ratings than when watching away from home. In the case of UES no statistically significant differences were found.

5.5 Discussion

5.5.1 Contextual effects upon subjective ratings.

Viewing Archetype

The most significant result from this study was the impact of Viewing Archetype on UES and satisfaction ratings. Users reported having different qualities of experience across the viewing situations in which they consumed video. Responses diverged enough between some Archetypes for the differences in ratings to be statistically significant, notably in comparisons of Quality Time and Opportunist Planning viewing to the other Archetypes investigated.

Opportunist Planning (where users consumed content away from home in an impromptu manner) consistently attracted lower ratings for both satisfaction and UES when compared to the ratings from those same users in other viewing situations. Satisfaction ratings were lower to a statistically significantly level when comparing Opportunist Planning situations to both Quality Time and Self Indulgence (see Table 5.6 on p168). The difference in UES ratings when comparing Opportunist Planning situations to Quality Time was also lower of a statistically significant level (see Table 5.7 on p171).

Consistently Quality Time attracted higher ratings then the other Archetypes for both satisfaction and UES. In terms of satisfaction, the positive difference in ratings for Quality Time when compared to ratings in other Archetypes by the same user were statistically significant in two of the three comparisons, (Self Indulgence being the only Viewing Archetype where the increase in ratings was not significant, see Table 5.6 on p168). Responses for UES mirrored those for satisfaction with a consistent positive difference in ratings (see Table 5.7 on p171). This was again statistically significant when comparing the same user's ratings in Quality Time to both Opportunist Planning and Space But Not Content.

Viewing in any of the Archetype situations that were conducted in a private environment consistently attracted higher ratings for both UES and satisfaction compared to viewing in public environments. Both individual private Viewing Archetypes such as Quality Time and Self Indulgence, as well as viewing in the home as a whole, provided statistically significant positive differences in satisfaction ratings compared to viewing outside the home (see Table 5.10 on p179). By being able to directly compare viewing experiences along this contextual cue, privacy has been identified as a significant contextual factor upon which many positive viewing UXs are built. Previous studies into TV consumption in the home have highlighted the importance of privacy. Describing it as central to the creation of feeling at home, and perceptions of the home as a relaxing place (Bernhaupt et al., 2008). However as studies have not compared those private environments to public viewing, fostering a feeling of privacy has not been explicitly identified in design user requirements (Obrist et al., 2008). However Tamminen et al. (2004) identified the importance of perceived privacy in the creation of many mobile experiences. Describing users actively attempting to create private spaces in public environments, and also noting users who perceived those attempts as creating different contexts.

Consumption Device

Findings from this study failed to shown that the device used to consume video was a significant factor in either satisfaction or UES ratings. Although set top box viewing attracted marginally higher ratings than other devices, and mobile devices marginally lower ratings for both satisfaction and UES, the differences in ratings were not statistically significant, (see Table 5.8 on p 172 and Table 5.9 on p 173). In a direct comparison of user ratings for set top boxes versus mobile devices within a single Archetype – (Self Indulgence), only minimal differences in ratings for both UES and satisfaction were seen. This difference is easily accounted for in the general variation seen across ratings.

This finding felt counter intuitive, and with larger sample sizes it is plausible device usage may become a more significant factor. It was expected that watching content through a set top box on a big screen TV would be more satisfying than watching on a mobile device. Lombard et.al (2000) found that viewing on a significantly larger screen (42” versus 12”) increased reported feelings of involvement and presence. Bracken & Atkin (2004) found viewing on larger screens (over 32”) increased users reported perceptions of realism. However the goals of these studies were not to look explicitly at satisfaction, nor to measure UX using a scale comparable to the UES. However the minor effects these factors appear to have had on the subjective ratings obtained during this study is notable.

Other work in the mobile video space is more supportive of the findings reported here. Knoche and Sasse (2009) showed that rather than absolute screen size, resolution and viewing ratio (the ratio of the screen size to the viewing distance) were the important factors in subjective video quality assessments on mobile devices, with users preferring a viewing ratio comparable to TV viewing. Even then, these factors were only critical in terms of minimum acceptability. Once above given thresholds they ceased to influence quality ratings. Results from (Ghinea & Patterson, 2011) further suggest that it is more than just the hardware used which effects user perceptions. In their study, whilst the user’s assessment of clip video quality was affected by alterations in frame rate of the media, differences in the hardware used had no effect. It is important of emphasize the focus of both these studies was once again video quality (in terms of image size, frame rate and resolution) rather than satisfaction or UX. However the results from both studies does allow us to consider that the user perceived differences in viewing experience between mobile devices compared to TV screens could be considerably less than may have been imagined. Additionally the results from the study in this chapter suggest those differences have considerably less effect on UX than the viewing situation in which you watch.

5.5.2 Evaluating the UES measure.

As well as measuring viewing experiences, a secondary aim of the study was to evaluate the chosen survey method as a tool for measuring viewing UX. This involved relating the UES measure to satisfaction. This was accomplished through correlation and showed a statistically significant relationship between the measures with a moderately strong correlation co-efficient of 0.63 (see Table 5.5 on p 159).

The UES itself was also evaluated as a tool for measuring viewing UX across contexts. This was achieved through a reliability analysis (see Section 5.4.2). This showed that whilst the UES was reliable as a uni-dimensional tool, at the multi-dimensional level of the UES subscales of Novelty (NO), Perceived Usability (PU), Aesthetics (AE), Focused Attention (FA), Endurability (EN) and Felt Involvement (FI) the tool was not internally consistent with loading of factors across subscale items.

Responses for Aesthetics and Novelty subscales within the UES provided unacceptable alpha levels for internal consistency (below 0.7). In further analysis of the UES the subscale for Perceived Usability attained both the highest alpha level for internal consistency (0.84) and strongest correlation to satisfaction (0.69). Figure 5.20 provides a visual depiction of the relationships between the different aspects of UES and satisfaction. In the diagram the distances between concepts are derived from the vector created by the three correlations made between the UES subscale items, overall UES and satisfaction (for detailed data see the correlation analysis in Appendix K, Section 10.11.2). From a visual inspection of Figure 5.20 it is possible to infer that responses from the Aesthetic subscale contribute to the variation in the correlations between overall UES and satisfaction.

On the basis that Aesthetic and Novelty responses could not provide satisfactory alpha levels for internal consistency, removing those subscales from the UES strengthens the correlation between the measures to 0.69 (see Table 5.12). A full exploratory factor analysis (EFA) at larger sample sizes would be needed to attempt a revised design of the questionnaire. However indications suggest reducing the number of factors could improve internal consistency and increase the correlation to satisfaction.

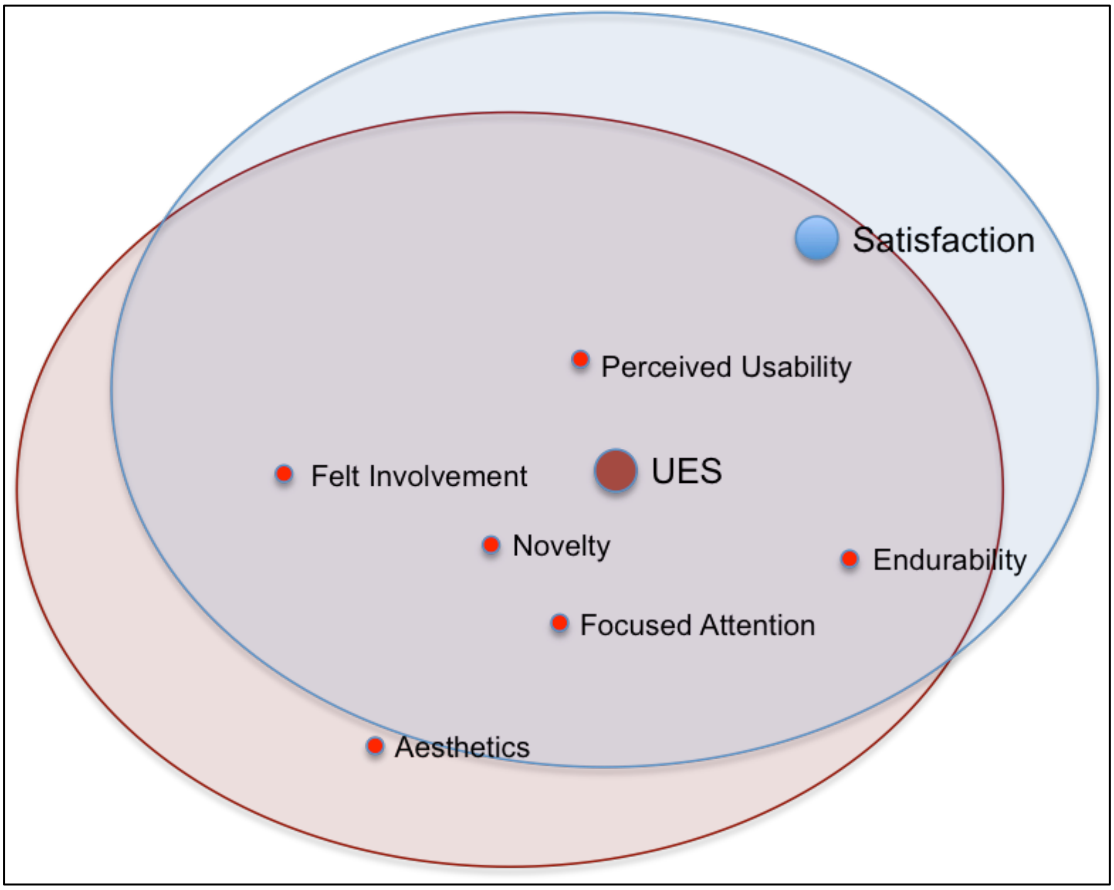


Figure 5.20. Venn diagram depicting the strength of correlations between UES subscales, overall UES and Satisfaction as the distance between vectors.

Indexes	Mean	Standard Deviation	r_s UES v SAT
Overall UES excluding Novelty and Aesthetics ratings	3.11	0.49	**0.69***
Satisfaction	3.50	1.11	

*Table 5.12. Summary analysis of correlations between Satisfaction and UES values excluding Novelty and Aesthetics. Analysis used Spearman's R. *Significant at <0.01.*

In terms of an evaluation of the UES the anomaly in Aesthetic ratings provides the most significant issue in relation to using the scale to measure video UX. It's possible video content represents a different domain of interaction design in terms of user's subjective responses to questions regarding Aesthetics. Upon analysis of the survey questionnaire wording (which can be reviewed in Appendix G, Section 10.7), Aesthetics questions included the application name in the text e.g. "…iPlayer is aesthetically appealing". This change to the survey questionnaire wording was made in accordance with similar contextualization of the UES when applied to different application domains (O'Brien & Toms, 2013). One possibility therefore is that users got confused when rating Aesthetics between rating the aesthetic qualities of the content, the image quality delivered by the device, and the visual attractiveness of the user interface of the application. It's therefore plausible that the Aesthetic subscale deployed in the UES tool may not be suited to capturing user responses in relation to video, as such applications have the possibility to be aesthetically judged across multiple dimensions.

Despite these limitations the UES has still been able to provide an overall measure of total experience. O'Brien and Toms (2013) argue that the UES includes items which are both hedonic and pragmatic. Collects responses that represent the user's state of mind (Focused Attention), and allows overall evaluations of the experience (Perceived Usability and Endurability). Therefore even with overlap of questions across subscales the UES provides a holistic measure of experience.

5.6 Conclusions

This study has allowed the measurement and comparison of viewing experiences. By using two scale measures, (UES and satisfaction) it has allowed the “quality” of the viewing UX to be measured and related to some aspects of context, (most significantly Viewing Archetype).

Through measurement it has been possible to conclude that sessions within some viewing situations (particularly the Quality Time Archetype) support significantly better experiences in comparison to others. More generally, the privacy afforded by viewing in the home appears a key factor in many positive experiences. In contrast, consumption device was not found to be a significant factor in driving those differences. This is an important finding as currently manufacturers put much effort into contextualising applications and content for specific devices, but very little effort into contextualising applications for viewing situations.

Limitations of this study were that due to asking users to collect viewing data based on their natural behaviours, there was a significant bias in the volume of data collected in some Viewing Archetypes. This restricted the level of analysis that could be carried out in some areas. Additionally the UES scale used in the study was found to lack internal consistency at the sub scale level. This prevented the use of the measure as a multi-dimensional tool.

Observational analysis of the same viewing sessions studied in this Chapter was conducted next. Factors observed on video in those viewing sessions were related back to the measures analysed in this study to understand the contribution they make to the creation of viewing UX.

6 Study 2, part 2. Characterising Video Consumption.

6.1 Introduction

Study 2, part 1 (see Chapter 5), focused upon measuring the viewing experiences of people watching video within natural situations. By employing a subjective questionnaire measure, statistically significant differences were identified in the UX's created across Viewing Archetypes. However survey methods in isolation cannot provide the richer insights regarding the interactions that actually occurred within those situations. Observation of the experiences was therefore additionally needed to provide the insights required to understand the experiential drivers influencing the subjective measures captured.

Past studies documented in the literature have utilised observational methods to provide qualitative snap shots of video viewing experiences, (O'Hara et al., 2007; Bernhaupt et al., 2008; Saxbe et al., 2011; Taylor and Harper 2003). However these studies have been from the perspective of characterising emergent video consumption scenarios and not from the basis of describing the experiential factors that influence viewing UX within given viewing situations. For purposes of clarity the author defines experiential factors as:

Factors within the viewing context that by their presence are indicative of the creation of a type of experience.

As such, experiential factors influence the perceived quality of the UX and impact subjective assessments of experience such as those collected within the last study. The author believes there is an important distinction between characterising scenarios of viewing and identifying experiential factors through measurement. Only by firstly quantifying the user's perceived quality of experience can observed aspects of those experiences be reliably drawn upon to inform future design.

Lack of knowledge in this area is an issue because future video systems may need to identify and act on the presence of factors within the viewing situation known to be indicative of creating specific types of experience. In the literature there still remains a lack of understanding around which factors contribute to the formation of different viewing experiences. Whilst some studies have looked at future video system user requirements, (Knoche and McCarthy 2005; Strohmeier et al., 2008; Obrist et al., 2008; Bernhaupt et al., 2009) these have been from the perspective of elicitation of user insights and desires, and not based upon an investigation of experiential factors in relation to measured assessments of experience. This difference is critical, (as the analysis in Chapter 5 has shown) due to the wide variability in the experiences created within specific Archetype viewing situations. Therefore if it is possible to improve the viewing UX through design adaption and personalisation it was key to understand which factors influenced the differences found in subjective measures for viewing satisfaction and UES.

The focus of this study was therefore to analyse the complementary observational video data deriving from the data collection for study 2, (as well as the sentiment analysis which formed part of the original quantitative questionnaire). The goal of the second part of the study was to undertake a thorough analysis of individual sessions to characterise the experiential factors present within those viewing situations previously rated for satisfaction and UES. The investigation therefore attempted to identify factors within the UX that could be associated with ranges of subjective ratings, so that such knowledge may be embedded into the design requirements for future systems.

6.2 Study Aims

Building upon the findings from Study 2, part 1 (in which core differences in the ratings for UES and satisfaction were seen when comparing viewing sessions across different Archetype situations) this study aims to understand the experiential factors associated with the subjective ratings obtained for those experiences. Specifically the study objectives were to:

- Use the subjective ratings for satisfaction and UES to identify example sessions of both positive, high quality and negative, low quality viewing experience.

- Use session video to identify the experiential factors present within high quality viewing experiences, in order to explain the subjective ratings these sessions received for both satisfaction and UES in comparison to other viewing.

- Use session video to identify the experiential factors, present (or absent in comparison to the sessions investigated above) within poor quality viewing experiences, in order to explain the ratings these situations received for both satisfaction and UES in comparison to other viewing.

- Identify if different experiential factors contribute to positive or negative viewing experiences within different Viewing Archetypes.

Understanding the experiential factors present in different Viewing Archetype situations was particularly important, as these comparisons represented the statistically significant differences in ratings obtained from the last study. Therefore by understanding the factors at work within those situations it would be possible to envision both general design and contextualised improvements in order to ameliorate the negative, and promote positive episodes of viewing within given contexts.

6.3 Method

Data collection for the study was executed at the same time as Study 2, part 1 previously documented in Chapter 5. The focus for this study was therefore those same users and viewing sessions. For a refresh on the general study design setup please review Section 5.3 on p 142. Further discussion in this section relates specifically to additional methods employed for this study and not previously described in Study 2, part 1.

6.3.1 Study Design Considerations

Video capture method

In order to fully characterise UX, the methodologies used needed to include an observational component in order to understand what was actually happening within sessions. The comparative benefits and drawbacks of a range of observational methods have been previously discussed in Chapter 3, and the methods selection outlined in this section should be viewed in the context of those conclusions.

Study 1 of the research (documented in Chapter 4) used self-reported video to investigate the issue of viewing context. That study concluded participant-captured video could maintain user privacy whilst providing insights comparable to those obtained via direct observation. However the aims of study 1 were only to capture the context of use and not the nuances of the UX itself, (as was required in this case).

Two issues identified with self captured video during study 1 were that both setting up the camera in terms of positioning of the device, as well as the procedure of starting the recording interfered with natural behaviours when initiating viewing. Using the same technique as in study 1 would therefore raise issues in terms of validity of the observations from the perspective of the study's aim of capturing natural viewing. To combat these concerns, modifications were made both to the video capture process and the camera technology employed. Smaller, unobtrusive, wearable cameras (the Muvi Pro Micro DV) were used to overcome the issue of positioning the device whilst viewing. Also the camera used one button start/stop technology and was fitted with a large 8GB memory card to ensure it could easily capture full viewing sessions with the minimum of user interaction.

The device was piloted by the author who recorded a number of viewing sessions prior to the study to understand the capabilities of the technology and the best advice to give to participants in terms of how to capture sessions whilst minimising interruption to the viewing session.

Developing a coding scheme tied to questions and concepts

In order to elicit objective and valid insights from observable data, systematic observational methods are required (Bakeman et al., 2005). Following the process laid out by Bakeman et al. a number of research questions were developed in order to drive the development of the video analysis coding scheme and address the wider aims of the study. The questions developed are noted below and focused on capturing a holistic picture of the viewing session in order to provide the best opportunities for identifying experiential factors. Whilst the Viewing Archetypes identified in the previous studies have been shown to influence the UX, this analysis addresses a further layer of analysis below the situation in order to understand the experiential factors at work within viewing contexts.

The questions were tied to Jumisko-Pyykkö and Vainio's (2010) framework elements for context to ensure wide coverage of possible factors, and therefore have been grouped into four core themes of technical context, (analysed through device activity), task context, (analysed through engagement with media), social context, (analysed through interpersonal interactions) and physical context, analysed through (local and micro mobility), see Table 6.1. Temporal context is considered separately through analysis of session duration and time stamping on the video itself.

Element	Questions
Technical Context (Device Activity)	• Did the nature of user interaction with the device, (such as time to set-up, find content and control settings – in addition to actually watching the content) influence user ratings? • Did the capabilities of the device to display content in certain circumstances, (such as losses in connection resulting in buffering) influence user ratings?
Task Context (Media Engagement)	• Did the level of attention the user was able to give to the media (in the context of exposure to other competing activities) influence user ratings?
Social Context (Interpersonal Interaction)	• Did the level and nature of social interaction in the environment influence user ratings?
Physical Context (Local and micro mobility)	• Did the user's posture, level of movement around the local environment and other mobility considerations such as the need to hold the device influence user ratings?

Table 6.1. Summary of questions tied to coding element themes.

Video analysis coding schemes

Coding schemes were created to identify experiential factors. Each set addressed one or more core themes and consisted of a mutually exclusive and exhaustive set of concepts as recommended by Bakeman et al. (2005).

The first scheme captured user activity and interaction with the consumption device. The goal of the device activity (DA) scheme was to understand both device interaction behaviour, (such as playing video, searching for content or altering settings) and the technical environment, (such as users dealing with technical issues or waiting for slow buffering content to play).

The second scheme addressed exposure to content and the levels of environmental distraction during consumption. The media engagement (ME) scheme therefore investigated the attentiveness given to content in the context of parallel distractions and tasks. This scheme used Holmes and Bloxham's (2007) levels of engagement scale (which was introduced in the methods discussion in Chapter 3) due to it's utility as a relevant and useful existing observational scale.

The third scheme captured interpersonal interactions. Lull (1990) showed television viewing plays a powerful role in the construction and maintenance of interpersonal relationships. Of interest in this context was if the nature, focus and amount of discussion between users in the viewing environment were associated with changes in the rating of the experience. The interpersonal interactions (II) scheme captured all verbal utterances between users, including gasps, groans and laughter directed directly at the content (Phatics). The scale used was based on Oehlberg et al's. (2006) typology of conversational themes for television viewing, but was modified to ensure the scheme was exhaustive.

The fourth and final scheme captured the users physical context, with particular focus on local and micro mobility as defined by Weilenmann (2003). Of interest in the physical context (PC) scheme was if the user's ability to comfortably relax or the need to relocate in the local environment during the experience, (such as changing trains or moving around the kitchen) was associated with changes in the rating of the experience. An additional consideration was if other aspects of micro-mobility such as the need to hold the viewing device also impacted ratings. Table 6.2 provides a summary overview of the coding schemes. Further detail including the individual codes is documented in Appendix L, Section 10.12.

Scheme	No. Codes	Reference to literature (if applicable).
Device Activity (DA)	9	N/A
Media Engagement (ME)	7	Holmes and Bloxham (2007)
Interpersonal Interaction (II)	11	Oehlberg et al. (2006)
Physical Context (PC)	10	Weilenmann (2003).

Table 6.2. Summary of video observation coding schema.

Considering non-observable factors

An additional concern for the study was the possible influence upon experience of other non-observable factors not considered within the general study design. A core consideration in this context was content selection. Whilst content selection is likely to have influenced user perceptions of the experience, the impact of individualised genres and programme preferences are impossible to elicit from an analysis of the video footage alone.

A separate analysis in additional to the video coding activity was therefore carried out to investigate the influence of content selection. This activity focused primarily on an analysis of the questionnaire verbatim collected in parallel to the video footage. This provided data on the content watched and also user comment around the experience generally. This was investigated to extract insight on the user’s perceptions to the content they selected. A secondary activity linking content aspects, (such as genre and running time) to session ratings was also carried out to understand if any of these factors might additionally be associated to perceptions of experience outside of the factors investigated through the video analysis.

6.3.2 Participants

As the data from this study was drawn from the same participant sample as Study 2, part 1, please refer to section 5.3.2 on p147 for discussions of initial sample size and recruitment, screening and retention of participants.

The Recruited Sample.

The video data analysed in this study was drawn from a subset of the total sample from which data was collected in Study 2, part 1. This meant that the recruited sample for this analysis represented a slightly different demographic from the first investigation. In total 33 viewing sessions were identified for investigation (see section 6.3.3 for a description of this process). These were drawn from n=24 of the original study cohort of 40 participants. This consisted of 13 males and 11 females. Ages ranged from 24 to 62 *(M=40, SD=13).* A further breakdown of participants by behaviours is shown in Table 6.3.

Total sample size	24
Age	Ranging from 24 to 62
Gender	13-Male 11-Female
Living in households with others	24
Regularly watch video content on a big screen TV at home via a set top box	17
Regularly watch video content on a mobile device	12
Regularly watch video via a games Console.	3
Regularly watch video content on a PC (desk or laptop)	12
Has watched video content on a device outside the home in last month	12

Table 6.3. Summary of user demographics.

6.3.3 Procedure

Identification of sessions to include in the investigation

An analysis was required to identify those sessions from amongst the wide range captured by users that could be associated with positive and negative viewing experiences. This raised the question of what level of subjective rating actually represented a positive or negative experience?

In Study 2, part 1 within subjects statistical tests were used to collect ratings to compare experiences across Archetype situations. This was in order to combat possible variability in rating style across the user sample. This approached clearly identified both the best and worst perceived experiences compared to the other sessions experienced by that individual user. However the aims of the study described in this chapter requires further resolution. Beyond the best and worst experiences for a particular user, this study additionally needed to identify those viewing sessions representing truly the most positive and negative experiences from the sample as a whole. This was a challenge as whilst from one user's perspective a rating of four out of five might represent an extremely positive experience, to another user it might only represent a slightly above average one. Therefore selection criteria were needed which looked beyond a single dimension of comparison.

An initial pass of the data was made to remove sessions for which no video existed (and so categorisation would be meaningless as no follow on analysis of the session detail could be made). Criteria were then created through which to classify sessions for inclusion within the video analysis investigation. Based on combating the within participant variability in ratings noted above, two criteria were employed:

- The upper and lower quartile of ratings for both satisfaction and UES were selected from across the sample. This filtering was carried out by Viewing Archetype and ensured the absolute highest and lowest rated sessions experienced within each Archetype were captured.

- A second filter was then applied to these sessions. This selected from the upper quartile only those sessions in which the responses for satisfaction and UES were above the mean responses from all sessions for that user, and selected from the lower quartile only those sessions in which the responses for Satisfaction and UES were below the mean responses from all sessions for that user.

Each criteria guarded against a different issue. Firstly by selecting the absolute highest and lowest values, the risk was reduced of mis-categorisation due to within participant variability across the three sessions the user rated. However the reasons for particularly high and low values across the sample as a whole could equally just be due to individual rating style (between subjects variability). Therefore by secondly selecting from within the first categorisation only those sessions that the user themself had perceived above or below average we additionally ensured the rating was not due only to the user's rating style but had actually been perceived as better or worst than the others they had experienced.

The number of sessions identified from the sample by the two-stage classification is documented in Table 6.4. An important point to make is that the focus of the categorisation was to find sessions where the quality of the perceived experience could be readily identified from the questionnaire ratings and therefore represented a useful example to pursue for video observation analysis.

The analysis in Chapter 5 showed a correlation between satisfaction and UES (Table 5.5) see p159. It could therefore be expected that the highest and lowest rated sessions for satisfaction would also attract equally high and low ratings for UES. However in a small number of examples (n=2), ratings of the two factors actually included classifications from opposite ends of the rating scales. Analysis of these sessions showed positive verbatim statements and high ratings for satisfaction but low ratings on the UES scale. This introduced the possibility that the questions on the UES scale may have been misinterpreted or filled in randomly. Removing these sessions from the dataset was important in terms of meeting the main study aims as the contradicting ratings raised ambiguity around whether those sessions had been truly perceived positively by the user.

Viewing Archetype	**Factor**	***Quartile Range***	***No. Session in Quartile range (Criteria 1)***	***No. Session meeting mean requirement (Criteria 2)***
Opportunist Planning	Satisfaction	UPPER	*5*	3
		LOWER	*5*	5
	UES	UPPER	*5*	*3*
		LOWER	*5*	*3*
Quality Time	Satisfaction	UPPER	*6*	*6*
		LOWER	*6*	*2*
	UES	UPPER	*6*	*6*
		LOWER	*6*	*1*
Self Indulgence	Satisfaction	UPPER	*11*	*7*
		LOWER	*11*	*10*
	UES	UPPER	*11*	*7*
		LOWER	*11*	*7*
Sharing Space Not Content	Satisfaction	UPPER	*5*	*3*
		LOWER	*5*	*4*
	UES	UPPER	*5*	*2*
		LOWER	*5*	*4*

Table 6.4. Summary of sessions passing the two stage filtering criteria.

In total (allowing for overlap of sessions which met the criteria both for satisfaction and UES) the activity identified a total of 33 sessions - 18 positively classified and 15 negatively classified.

Coding protocol

The process to code the selected video data followed the recommendations of Bakeman et al. (2005) for sequential analysis. Several passes were made of the video, (one for each coding scheme) and frequency and onset times for individual codes captured. As the set of codes in each scheme were mutually exclusive and exhaustive this exercise resulted in every second of every video investigated being assigned to one code in each of the four schemes.

Data Analysis

Descriptive statistics for the coding sample as a whole were generated before the data was analysed in relation to concepts of interest, namely:

1. Comparisons in coding between all sessions classified positively for satisfaction and UES compared to negatively classified sessions.

2. Comparisons in coding between sessions classified positively and negatively for satisfaction and UES by Viewing Archetype.

In both cases the analysis was at the level of descriptive statistics including average durations, relative frequency and boxplots to show distributions. Basic statistical analysis was employed where useful. The observed frequency distribution of codes across positively and negatively rated sessions was compared against what might be expected by chance using Chi squared tests. The duration of codes, (both as individual instances and when summed across a session as total time) were investigated to understand differences in duration between positively and negatively rated sessions. Where normal data could be assumed (Shapiro-Wilk W $p<.05$), mean and standard deviation have been reported. The means of responses were also compared using independent *t* tests. Responses for some codes could not always be assumed to have come from normal distributions (Shapiro-Wilk W $p>.05$), in these cases medians have been reported and non-parametric Mann Whitney U tests used to compare mean ranks.

In circumstances were the coding analysis identified interesting patterns in codes that related to differences in user ratings, a further observational analysis was conducted. This was to uncover the detailed circumstances and events occurring within those sessions at the time stamps where the code was captured. A qualitative analysis was also carried out of the whole session to understand the general themes and experience outcomes surrounding the time stamped events of interest.

This general approach to analysis has been used throughout the Chapter. More detail on the investigations within this section is available in Appendix M, Section 10.13.

An additional analysis was also carried out on free text content provided by participants in the open comments box of the questionnaire. An open coded list of comment subjects were created based on interpreting the verbatim. An affinity diagramming process (Holtzblatt & Jones, 1993) was then carried out to categorise the comment subjects into logical groupings around a theme. In some cases where a comment covered multiple themes it was logical to categorise the comment under 2 or more groupings. This process identified 22 themes. Frequency of the theme was recorded as was the sentiment of the comment. This was inferred from the verbatim itself and the ratings the user had given during the sessions for satisfaction and UES.

6.3.4 Study Materials

The screening questionnaire used to recruit participants is reproduced in Appendix H, Section 10.8.

The survey questionnaire is reproduced in Appendix G, Section 10.7.

The specification of the camera used is provided in Appendix I, Section 10.9.

The video coding protocol is described in Appendix L, Section 10.12.

6.4 Results

6.4.1 Overview of the data capture

An overview of the sessions identified for inclusion in the study (as documented in the process described in Section 6.3.3) is provided in Figure 6.1. A further break down of the same sessions including the viewing device is provided in Table 6.5. A high level summary of the total data collection from the video coding exercise can be reviewed in Table 6.6.

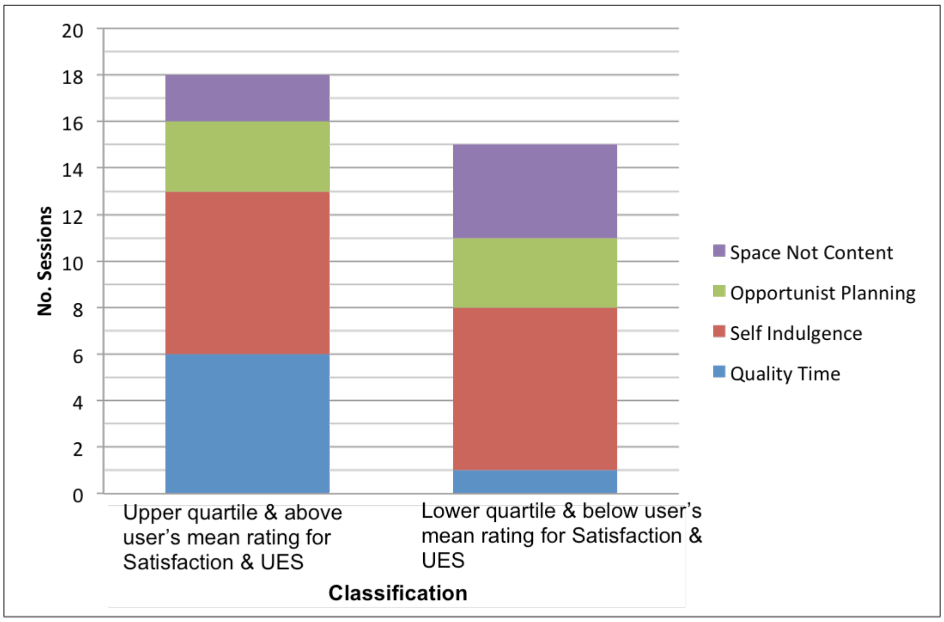


Figure 6.1. Classification of sessions for video analysis related to Viewing Archetype.

Classification	**Device**	***Viewing Archetypes :*** *Opportunist Planning (OP), Quality Time (QT), Self Indulgence (SI), Sharing Space Not Content (SNC).*			
		OP	QT	SI	SNC
Positive	Mobile Device	3		5	1
	Set Top Box		4	1	
	Desktop PC			6	2
	Laptop PC		1	1	
	Games Console		2		
Negative	Mobile Device	3		2	1
	Set Top Box			3	2
	Desktop PC	1		1	1
	Laptop PC	2	1	1	
	Games Console		1	3	

Table 6.5. Summary of sessions selected for video observation.

Average Duration	**Code**	**Mean Time (Secs)**
All Sessions	-	1760
Most frequent codes, (by scheme)	**Code**	**No. (Instances all sessions)**
Device Activity	DA4 – User is waiting for content (Buffering or Errors).	55
Media Engagement	ME6 – Device video is the only media source and media consumption is the only user activity.	43
Interpersonal Interaction	IL0 – No Verbalisation.	268
Physical Context	PC2 – User is sitting down (upright).	26
Longest duration (per instance)	**Code**	**Mean Time (Secs)**
Device Activity	DA8 – Video content is playing full screen.	953
Media Engagement	ME6 – Device video is the only media source and media consumption is the only user activity.	848
Interpersonal Interaction	IL0 – No Verbalisation.	165
Physical Context	PC4 – User is lying down.	2059
Longest duration (sum of instances per session)	**Code**	**Mean Time (Secs)**
Device Activity	DA8 – Video content is playing full screen.	1865
Media Engagement	ME6 – Device video is the only media source and media consumption is the only user activity.	1657
Interpersonal Interaction	IL0 – No Verbalisation.	1691
Physical Context	PC3 – User is sitting down, (lean back).	2435

Table 6.6 Summary of video observation data collection.

6.4.2 Device Activity (DA) codes by session outcome.

Frequency of codes (DA)

Responses for relative frequency across device activity codes is presented below in Figure 6.2. The most commonly coded instance was DA4 - *User is waiting for content, (buffering or errors).*

Code DA8 – *Video is playing full screen* was the only DA code were the differences in frequency between positively and negatively rated sessions was statistically significant with higher frequencies of the code observed in positively rated sessions. X^2 *(df1, n=45) =4.97, p=0.02.*

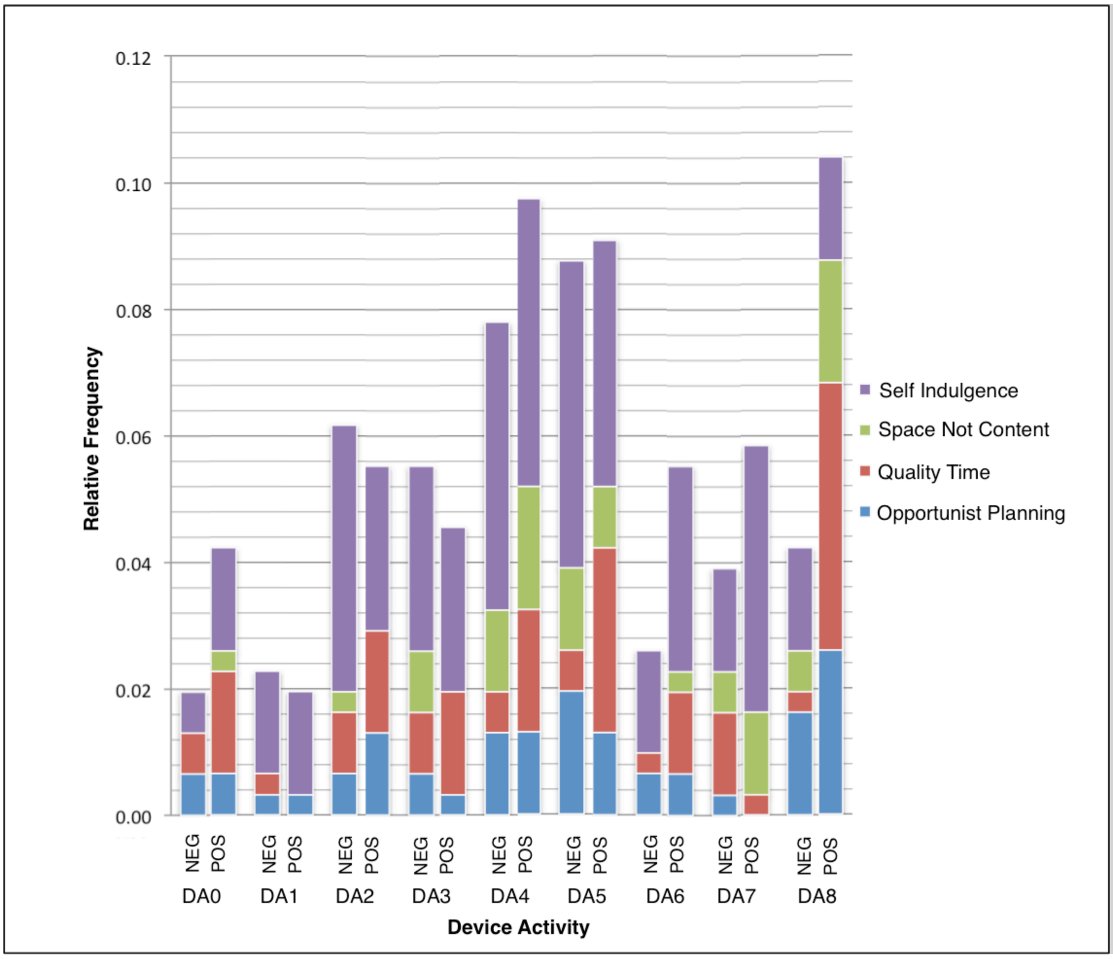


Figure 6.2. Device Activity. Relative frequency of coded instances. Positively rated sessions versus negative. Breakdown by Viewing Archetype.

Code duration per instance (DA)

Boxplots for durations per instance for DA codes can be reviewed in Figure 6.3. The code with the longest average duration per episode was DA8 – *Video content is playing full screen*.

Four DA codes had longer average duration per coded instance within negatively rated sessions when compared to positively rated ones. These were DA0 – *Device is not in use,* DA3 – *User is searching for content,* DA4 – *User is waiting for content* and DA7 – *User is watching in a window.* Except for DA0, all reported differences showed large outliers within the negatively classified sessions, most significantly within DA2 codes. This suggests significant issues in reaching content in some of the viewing sessions leading to extremely long code durations. This will be investigated further through observation. Despite the noted difficulties none of the differences were statistically significant.

Code duration when all instances from a session are summed (DA)

Boxplots for durations when all instances from a session are summed for DA codes can be reviewed in Figure 6.4. The code with the longest average duration per session when summed was DA8 – *Video content is playing full screen*.

Code DA4 – *User is waiting for content* is noteworthy for attracting longer average summed durations in negatively classified sessions *(M=27 SD=28)* when compared to positively classified *(M=12 SD=8).* Differences were significant *t(df27) =2.05, p=0.049*. There were no other significant differences in the summed duration of codes across the rest of the device activity scheme.

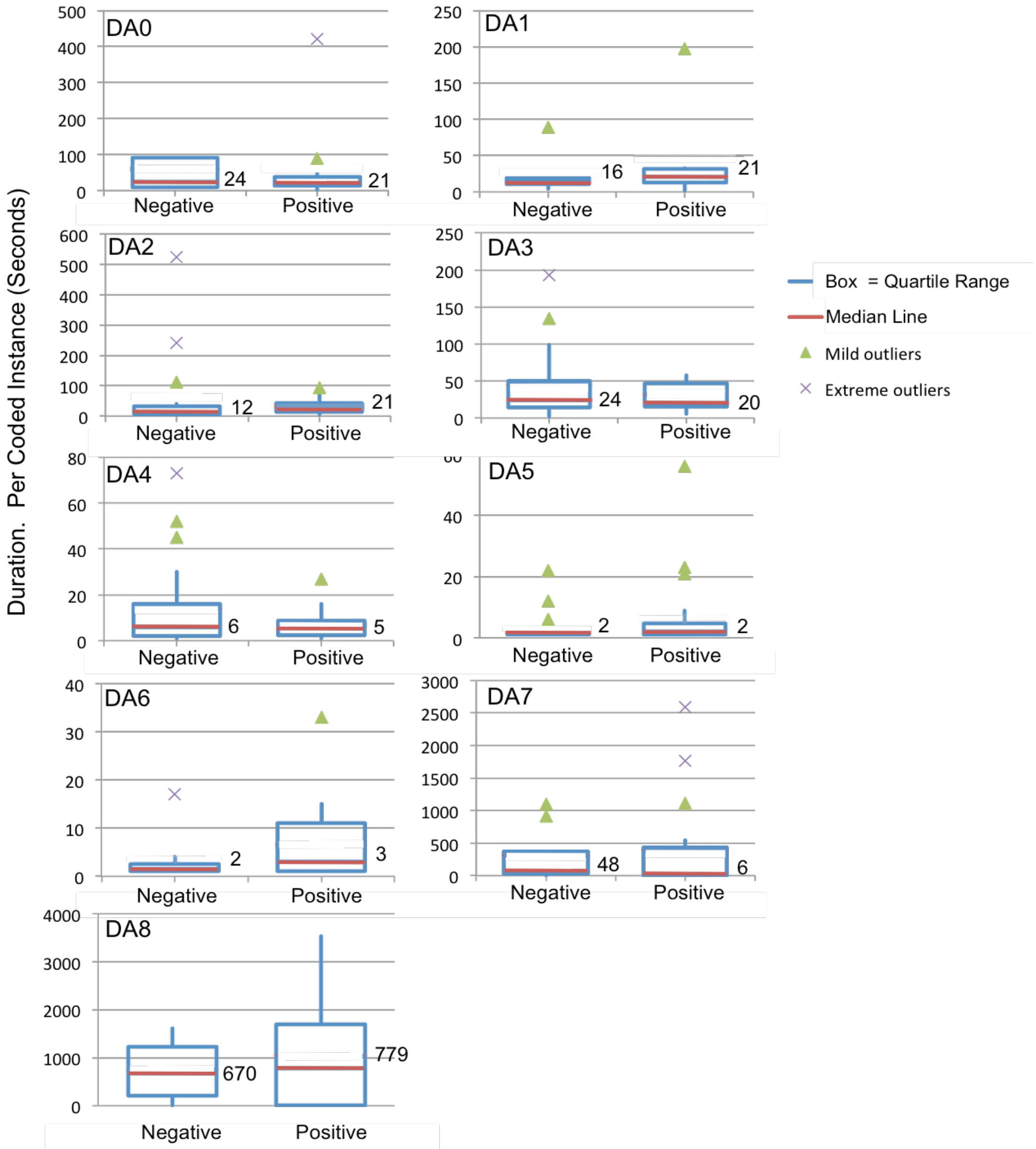


Figure 6.3. Device Activity. Boxplots of length of coded instance (seconds). Positively classified sessions versus negatively classified.

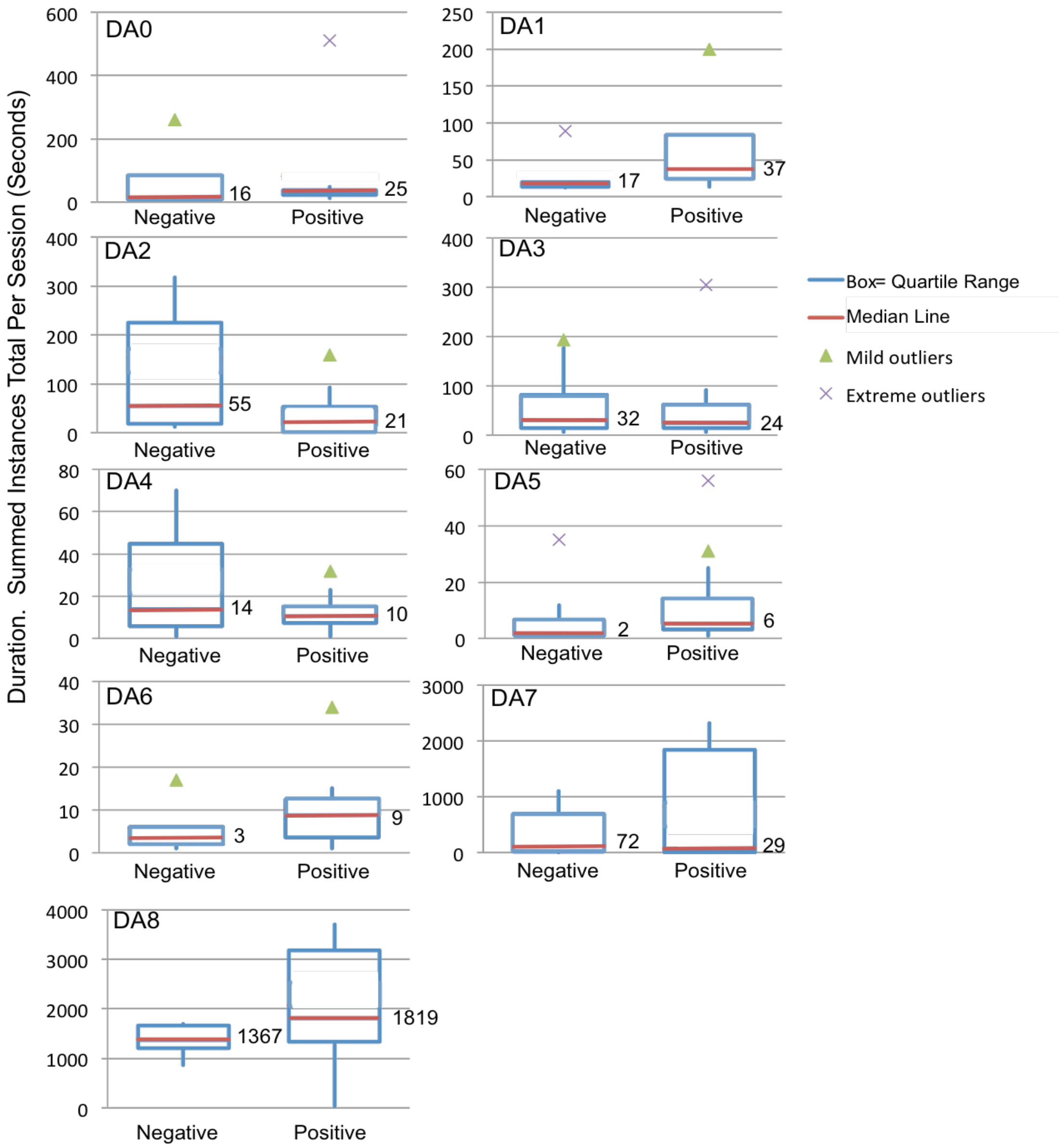


Figure 6.4. Device Activity. Boxplots of length of coded instance, summed by session (seconds). Positively classified sessions versus negatively classified.

Observational insights (DA)

Based on the insights from analysis of DA code frequency and duration, a subset of sessions was selected for investigated in greater qualitative detail. Table 6.7 provides an overview of the codes analysed and justification for selection.

Code	No. Sessions	Reason for selection
DA4 – User is waiting for content.	29	Statistically significant longer durations of summed instances per session, in negatively rated sessions.
DA2 – User is preparing to play video	20	Noted outliers with much longer durations for summed instances in negatively rated sessions.
DA8 – User is watching full screen	23	Statistically significant higher frequency of code in positive sessions.
DA7 – User is watching in a window	15	Included to compare and contrast to DA8 codes. Although there were higher frequencies of DA7 codes in positive sessions, the median durations of DA7 codes both by instance and when summed were longer in negative sessions.

Table 6.7. Sessions with device activity codes selected for observational analysis.

DA4 – *User is waiting for content.*

This analysis included 29 sessions, (16 of them positive). Table 6.8 provides an overview of the Viewing Archetypes these sessions were captured in.

Archetype	Positively Classified Sessions	Negatively Classified Sessions
Opportunist Planning	2	2
Self Indulgence	7	7
Quality Time	5	1
Sharing Space Not Content	2	3

Table 6.8. Sessions attracting DA4 codes (by Viewing Archetype).

Review of the video data showed that buffering and waiting for content was a component of nearly every session, no matter if positively or negatively rated.

Irrespective of device it was very common to observe at least a few seconds of buffering at the start of viewing (n=28 of 29). This largely explains the similar levels in relative frequency for the DA4 code across both positively and negatively classified sessions (see Figure 6.2).

Figure 6.5. Buffering was seen at the start of nearly every session independent of if the session had been classified positively or negatively.

The statistically significant differences in DA4 duration seen between negatively and positively classified sessions were the result of much longer buffering durations in some of the negatively classified sessions (5 of 13). The other eight had summed DA4 durations across the session comparable to positive sessions (between 7 and 15 seconds). Buffering in these sessions was also only seen at the start of viewing (as in the positively classified sessions). These factors suggest buffering in those eight sessions was unlikely to have strongly contributed to the negative ratings received and therefore other factors were at play. Investigation of the questionnaire verbatim indicated that users had cited other reasons for the negative ratings. These were (in order of frequency cited);

navigation difficulties, environmental distractions, video quality and content selection, (see Section 6.4.6 for the verbatim analysis).

Analysis of the video showed a number of different reasons for the longer DA4 durations in the other five negatively rated sessions. Two sessions showed very similar difficulties, with the users operating iPhones and having to watch the buffering icon in the player window for a long time before the devices finally reacted. They each waited over thirty seconds for this to happen. In one scenario the user received a failure message, for the other user the video did eventually start. The issue eroded the experience to some extent and both users mentioned the problems in their sentiment verbatim. For the user who did eventually get the content to play the buffering problem was clearly not the only factor considered when providing a negative rating. This user was watching video and preparing food in parallel:

> *"Some technical issues with the video cutting out. Felt constantly distracted by what was going on around me."*

The final three negatively classified sessions with long DA4 durations each occurred in different scenarios. One depicted a user attempting to watch during a work break. IP blocking software stopped them, but the warning message only appeared on screen after a significant amount of time. The second example was a user skipping through a very long programme on which they had appeared in the crowd (Sports Relief). The user was using the scrub bar in the user interface to locate the parts of the programme in which he had appeared. As some buffering occurred every time he moved the bar, it added up to a significant amount of time waiting for content over the course of the session. The final example was on a set top box and was caused by an abnormally long buffering process at the start of viewing. Interestingly although all these sessions included well over 30 seconds of buffering across the session, only the user who failed to watch due to IP blocking explicitly mentioned the problem in the sentiment verbatim.

DA2 – *User is preparing to play video.*

This analysis included 20 sessions, (13 of them positive). Table 6.9 provides an overview of the Viewing Archetypes these sessions were captured in.

Archetype	Positively Classified Sessions	Negatively Classified Sessions
Opportunist Planning	1	1
Self Indulgence	7	4
Quality Time	5	1
Sharing Space Not Content	-	1

Table 6.9. Sessions attracting DA2 codes (by Viewing Archetype).

Instances of DA2 codes from negatively rated sessions depicted examples of critical setup errors. These occurred early in the sessions and in 4 of the 7 cases resulted in an inability to access video at all. Only one example of errors under this code was captured outside the home, (on a train). The other examples were all in the home but significantly using devices that did not offer instant-on video access, (e.g. mobile devices and games consoles as opposed to set top boxes). In fact only one example was captured of a negatively classified session with extended setup time on a set top box.

Errors captured within DA2 codes were observed as predominantly software and file compatibility issues (4 of 5). One other user on a PS3 experienced a connection issue. File errors appeared particularly frustrating on mobile devices and games consoles, as the user was still able to access the user interface, browse and select content, but received an error when attempting to actually watch. This meant quite some investment had been put into the experience before the failure manifest itself. Accounts from the questionnaire sentiment convey the level of user frustration:

“Using it on my mobile was one of the most annoying experiences of my life to date! It didn’t work. I spent almost 20 minutes phaffing around. I was on my home Wi-Fi and it has worked before so I don’t know why it wouldn’t play.”

When errors occurred they presented themselves to the user in overtly technical terms. Two users attempting to watch on a Wii games console received a generic error message with an error code. Two other users attempting to watch on iPhones received browser plugin errors, again with error codes.

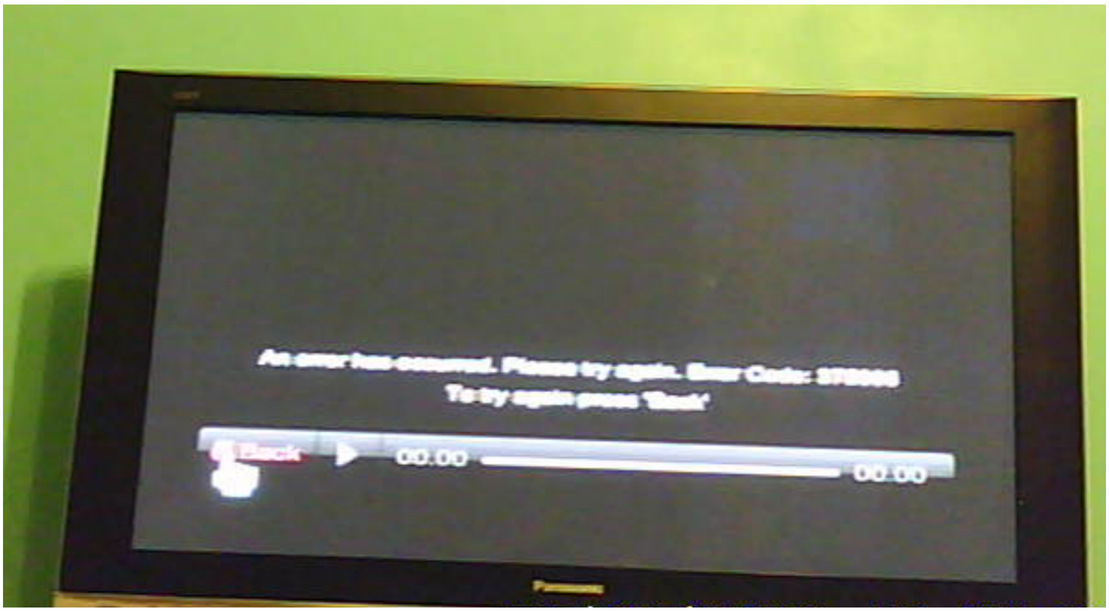


Figure 6.6. A typical error message user’s saw when attempting to play video on the Wii – “An error has occurred. Please try again. Error Codes 378308”.

User strategies to deal with setup errors were limited. Most users simply tried to reload the content with no success at all (3 of 5). The second most popular solution was to restart the application, relocate the content and reattempt streaming (2 of 5). This represented a doubling of the initial setup investment.

As noted earlier, 4 sessions with extended setup processes resulted in an inability to play content at all. This accounts for the increased representation and longer summed durations of DA2 codes in negatively classified sessions. The total running time for these sessions was actually very short, (as no content was ever watched) however DA2 coding accounted for nearly the whole session length.

An additional and important insight was that not all negatively classified sessions with DA2 codes encountered technical difficulties. Two of the examples actually had swift set-up processes, however in these sessions those users encountered a number of navigation difficulties. A set top box user was unable to find the video on-demand service from the onscreen menus and wasted a considerable amount of time locating it (this was also one of the sessions providing an extreme outlier in average duration per coded instance within the negatively classified sessions). The other session was on a Wii games console and the user had difficulty navigating laborious menu structures and overcoming user interface latency.

DA2 code durations from positively rated sessions were of course shorter and 12 of 13 of them collected from home contexts. The remaining session was on a mobile device in public. In that case the user had pre-downloaded the content to the phone and then chose to watch (with no issues) when out and about. This however was the exception, and the majority of positive sessions occurred through a set top box (8 of 13). Reliable Internet connections made access to video on set top boxes swift in the majority of cases. Additionally a significant minority of these sessions were also undertaken on PCs in the home office (4 of 13). Whilst these sessions did include one or two start-up issues, (a browser crash and a bug when trying to start video in a pop-up window) these were quickly resolved and critically the users went on to successfully view video with minimum delay. Therefore it would seem whilst no individual device type provided seamless access to video, those in the home with reliable high speed connections offered the best opportunities to keep DA2 code durations to the minimum.

DA7 & DA8 – *User is watching in a window / User is watching full screen.*

Analysis of sessions with DA7 & DA8 codes was carried out in parallel in order to compare and contrast the data. The analysis included 15 sessions with DA7 codes, (8 of them positive) and 23 sessions with DA8 codes (16 of them positive). Table 6.10 provides an overview of the Viewing Archetypes these sessions were captured in.

DA7 – User is watching in a window		
Archetype	Positively Classified Sessions	Negatively Classified Sessions
Opportunist Planning	-	1
Self Indulgence	6	3
Quality Time	1	1
Sharing Space Not Content	1	2
DA8 – User is watching full screen		
Archetype	Positively Classified Sessions	Negatively Classified Sessions
Opportunist Planning	3	1
Self Indulgence	5	4
Quality Time	6	0
Sharing Space Not Content	2	2

Table 6.10. Summary attracting DA7 & DA8 codes (by Viewing Archetype).

Analysis showed that in the majority of cases where the user viewed in a window (DA7 codes) this was actually a transitory state in which users verified the quality of the video stream and made setup alterations (such as fine tuning volume). Of the fifteen sessions where viewing in a window was coded, nine of the examples showed the user switching to full screen viewing within the first minute of watching. The core context in which the whole session was maintained in a window was when the user shared their attention between watching video content and carrying out other tasks either on the computer, (such as surfing or word processing) or off device, (including examples of doing paperwork and preparing food). In all of these cases, secondary activities not only appeared to draw attention from the viewer, but also eventually overtook the viewing activity, leading to most sessions being curtailed early. Only one of the six examples where the user watched exclusively in a window lasted the whole duration of the programme. This was also the only session captured in this scenario rated positively. In that session the user streamed a short factual magazine programme. He used the video content almost as radio, listening to the audio from the programme whilst visually focusing on work on another screen, (see Figure 6.7).

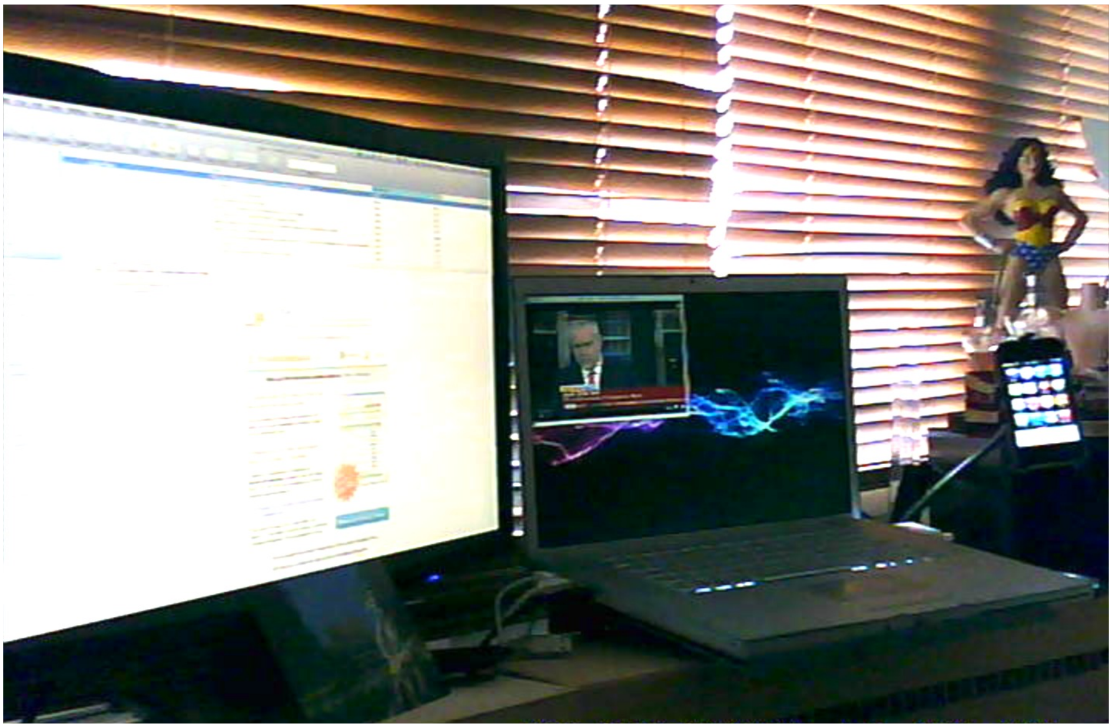


Figure 6.7. Only users who planned to share their attention between video and another activity chose to watch in a window for the duration of the session.

When watching in full screen, sessions rated negatively suffer from the user being unable to maintain interest. The majority of these sessions exhibited no obvious issue that could easily be attributed to the poor rating, although many of these users incurred difficulties at some point of the session (5 of 7). Negatively rated sessions in this scenario also attracted negative verbatim sentiment and ended early (6 of 7). Another insight is that in all these cases the user was the only one watching the content. In fact only one of the sessions noted occurred in the living room. Not one Quality Time Viewing Archetype situation where the users got to the point to actually watching content attracted negative ratings.

Of the sixteen positively rated sessions watched in full screen, only three were stopped before the end of the content. Of those only one was stopped due to user choice rather than external constraints (including scenarios such as trains arriving at destinations). Examples of sessions watched exclusively in full screen came from across the Viewing Archetypes. Opportunist Planning examples showed scenarios where the content had previously been downloaded and the user used headphones to consume. Of the three positive examples captured in this Archetype two were ended early (due to external factors) however sentiment was very positive with one of the users commenting they would pick the programme back up later to finish watching.

Figure 6.8. A positive full screen experience outside the home using headphones.

Quality Time was the most widely represented viewing situation attracting DA8 codes. All but one of these sessions was through the main TV in the living room (although the sources included a range of STBs and games consoles). These were extended sessions with five of the six lasting over fifty minutes. Three of the six users additionally commented in verbatim sentiment that the experience of watching in full screen high definition had added to the experience:

> *"Enjoyable and interesting. I knew what I wanted to watch. Scenery detail was great on the big screen".*

Perhaps significantly these users had chosen to watch visually rich documentary content including "Tropic of Cancer" and "Wonders of the Universe". Self-indulgence situations with DA8 codes widely mirrored Quality Time. These occurred either in the living room on TVs, (3 of 5) or on desktop PCs with large monitors (2 of 5). Setup was straightforward and there was again a bias in content selection towards visual imagery and HD content. Even users at computer desks attempted to recreate big screen living room experiences with one example captured of watching with the lights off.

The two positively classified Sharing Space But Not Content sessions were a totally different class of experience. Conducted in full screen, these sessions (though starting as solitary experiences) evolved into highly social sessions with the video as the focus of conversation rather than consumption. Viewing size and quality appeared to have little bearing on the experience in these scenarios, and no comments regarding video quality were captured in the sentiment questionnaire.

6.4.3 Media Exposure (ME)– Codes by session outcome.

Frequency of codes (ME)

Responses for relative frequency across media exposure codes is presented below in Figure 6.9. Data sparsity prevented analysis of some codes. From those that could be investigated the most commonly coded instance was ME6 - *Device video is the only media source and media consumption the only activity*. There were statistically significant higher frequencies of ME6 codes captured in positively rated compared to negatively rated sessions. X^2 *(df1, n=43) =6.84, p=0.008.*

There were no other significant differences in frequency rates between positive and negatively classified sessions across the rest of the media exposure scheme.

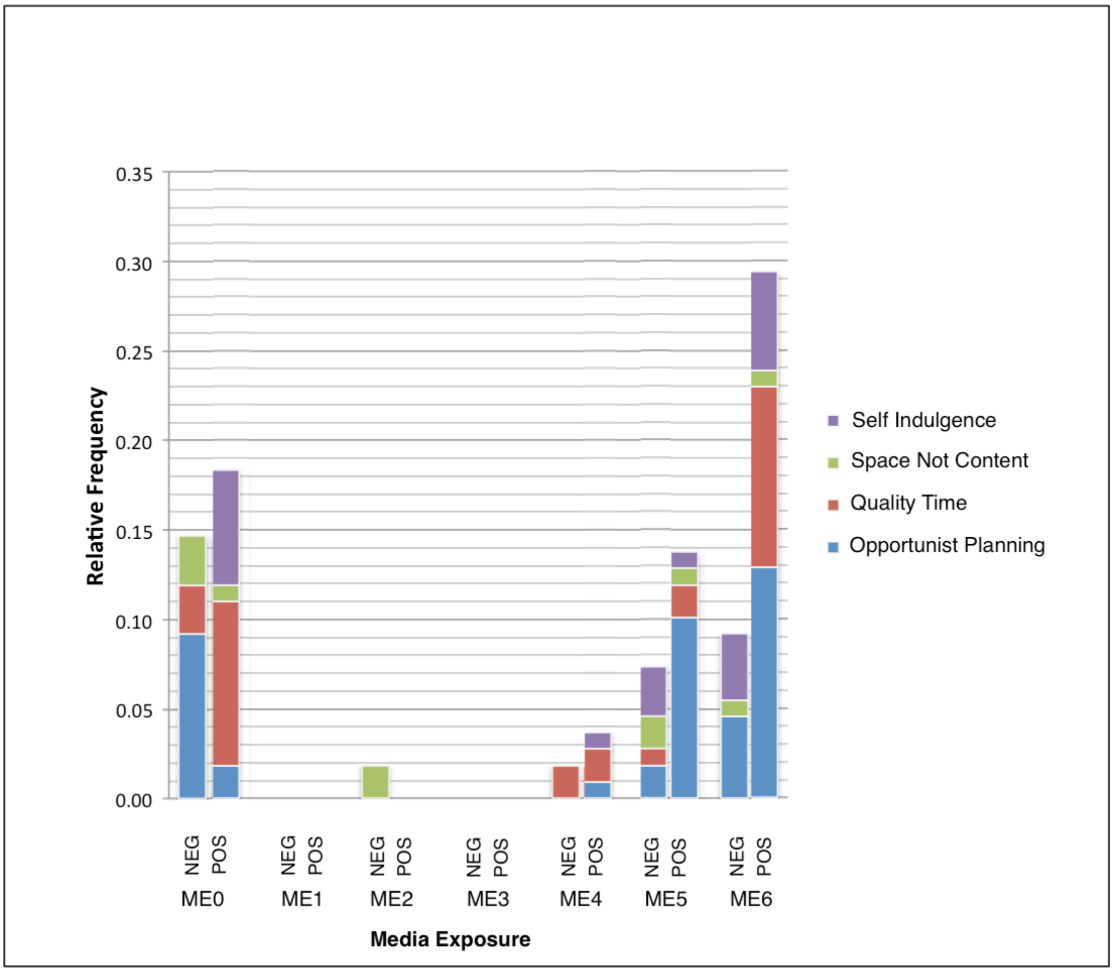


Figure 6.9. Media Exposure. Relative frequency of coded instances. Positively classified sessions versus negative. Breakdown by Viewing Archetype.

Code duration per instance (ME)

Boxplots for durations per instance for ME codes can be reviewed in Figure

6.10. The code with the longest average duration per instance was ME6 – *Device video is the only media source and media consumption is the only user activity.* Within the statistical analysis none of the codes provided any significant differences in duration per instance between positively and negatively rated sessions.

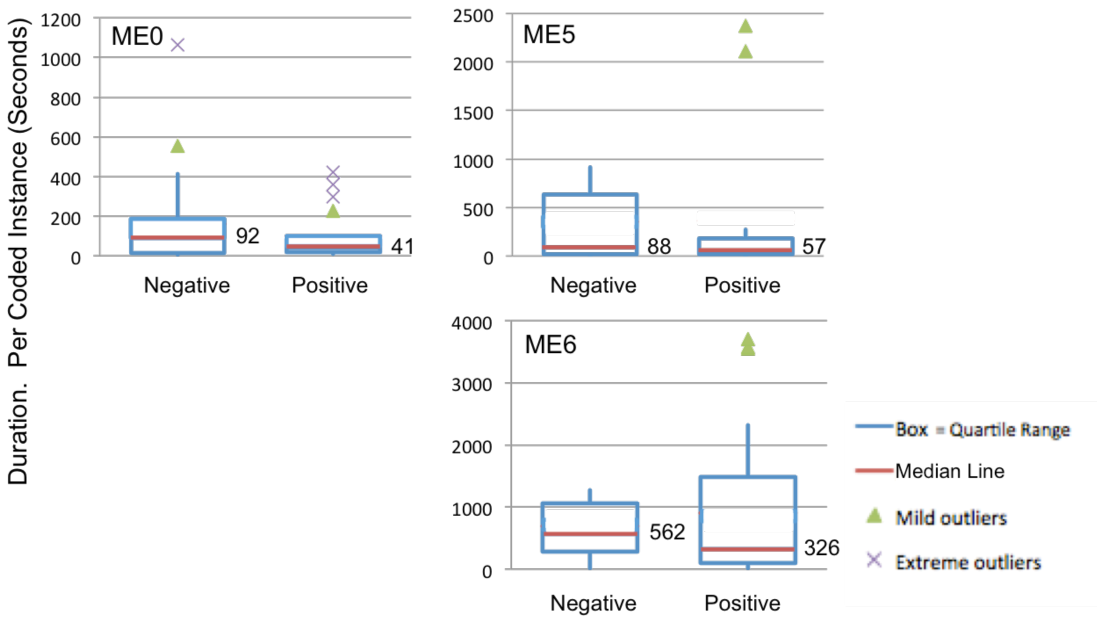


Figure 6.10. Media Exposure. Boxplots of average length of coded instance (seconds). Positively classified sessions versus negatively classified. (Not enough examples to compare ME1, ME2, ME3 or ME4).

Code duration when all instances from a session are summed (ME)

Boxplots for durations when all instances from a session are summed for ME codes can be reviewed in Figure 6.11. ME6- *Device video is the only media source and media consumption is the only user activity,* achieved the longest average durations.

ME0 – *Video not present,* provided a statistically significant difference in summed duration between positively rated (*Mdn = 59*) and negatively rated (*Mdn = 172*) sessions, U = 141, p = 0.045. There were no other significant differences in the summed duration of codes across the rest of the media exposure scheme.

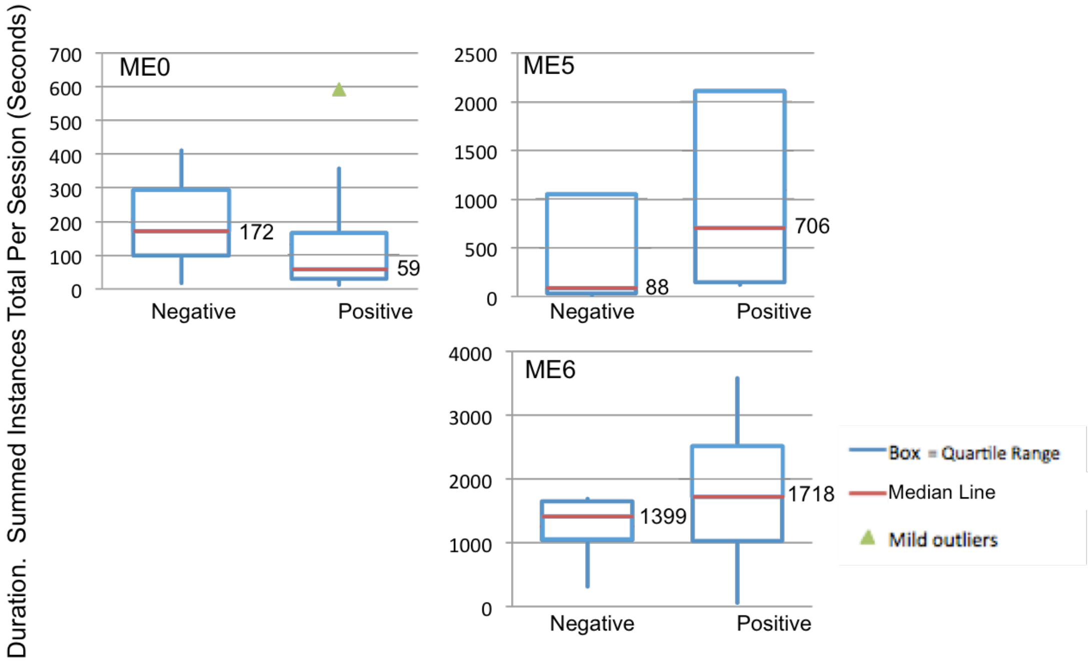


Figure 6.11. Media Exposure. Boxplots of average length of coded instance, summed by session (seconds). Positively classified sessions versus negatively classified. (Not enough examples to compare ME1, ME2, ME3 or ME4).

Observational insights (ME)

Based on the insights from analysis of ME code frequency and duration, sessions of interest were investigated in greater qualitative detail. Table 6.11 provides an overview of the codes to be analysed and justification for selection.

Code	No. Sessions	Reason for selection
ME0 – Video not present.	28	Statistically significant longer durations of summed instances per session, in negatively rated sessions.
ME6 – Device video is the only media source and media consumption is the only user activity	22	Statistically significant higher frequency of code in positively rated sessions.
ME5 – Device video is the only media source but media consumption is a secondary user activity	10	Included to compare and contrast to ME6 codes. Although there were higher frequencies of ME5 codes in positive sessions, the differences were not statistically significant. In addition whilst summed median duration for ME5 was longer in positive sessions, median duration per instance was shorter in positive sessions compared to negative ones.

Table 6.11. Sessions with media exposure codes selected for observational analysis.

<u>ME0 – *Video not present.*</u>

This analysis included 28 sessions, (15 of them positive). Table 6.12 provides an overview of the Viewing Archetypes these sessions were captured in.

Archetype	Positively Classified Sessions	Negatively Classified Sessions
Opportunist Planning	2	3
Self Indulgence	6	6
Quality Time	6	1
Sharing Space Not Content	1	3

Table 6.12. Sessions attracting ME0 codes (by Viewing Archetype).

There were thirteen negatively classified sessions coded with longer summed durations of ME0 code. Unsurprisingly these viewing sessions included the earlier discussed examples in which users had encountered setup problems preventing content from being played at all (7 of 13).

Other examples included sessions where content was played, however the user incurred extended difficulties early in the session either setting up the device or locating content of interest (6 of 13). Generally this delay explains the low frequency but long duration of ME0 codes.

ME0 codes originating from negatively classified sessions were noted within all Viewing Archetypes. However only one negatively classified Quality Time session with ME0 codes was captured. This session depicted initial setup issues on a PS3 before the user gave up to watch on a laptop.

Half of all Self Indulgence sessions attracting ME0 codes ended in a negative rating (6 of 12). Whilst a small number of these sessions exhibited fatal setup issues (n=2), the other 4 showed a repeating pattern of behaviours in which users after getting over initial setup problems appeared to lose interest in viewing and opted to end viewing early. This pattern was also identified in the three negatively rated Sharing Space but not Content Archetype sessions also attracting ME0 codes.

Positive sessions with ME0 codes followed very consistent patterns with the code durations being logged at the start of sessions when users are setting up devices and looking for content. Even in positively rated sessions some time was typically spent on this activity. A further common occurrence, (specifically seen in positive Quality Time viewing situations) was the user pausing content to fix drinks or take rest breaks (3 of 6). As discussed later in this section these events commonly coincided with the local and macro mobility code PC0 – *User is walking*.

ME5 & ME6 – *Device video is the only media source but media consumption is a secondary user activity / Device video is the only media source and media consumption is the only user activity.*

Analysis of sessions with ME5 and ME6 codes was carried out in parallel in order to compare and contrast the data. The analysis included 10 sessions with ME5 codes, (5 of them positive) and 22 sessions with ME6 codes (16 of them positive). Table 6.13 provides an overview of the Viewing Archetypes these sessions were captured in.

ME5 – Device video is the only media source but media consumption is a secondary user activity.		
Archetype	Positively Classified Sessions	Negatively Classified Sessions
Opportunist Planning	2	1
Self Indulgence	1	2
Quality Time	1	0
Sharing Space Not Content	1	2
ME6 – Device video is the only media source and media consumption is the only user activity.		
Archetype	Positively Classified Sessions	Negatively Classified Sessions
Opportunist Planning	3	1
Self Indulgence	6	4
Quality Time	6	0
Sharing Space Not Content	1	1

Table 6.13. Summary of sessions attracting ME5 & ME6 codes (by Viewing Archetype).

Five sessions with ME5 codes attracted negative ratings. Three of these actually oscillated during the session between ME5 and ME6 codes. The other two maintained ME5 media exposure levels throughout. The key aspects of all these sessions appeared interruption and distraction. Examples included taking phone calls, preparing food, and working on the computer in parallel. Critically, in all cases the distraction was focused away from the content on an external event or activity in the environment. Interestingly all of these sessions happened in the day or late afternoon, but not in the evening.

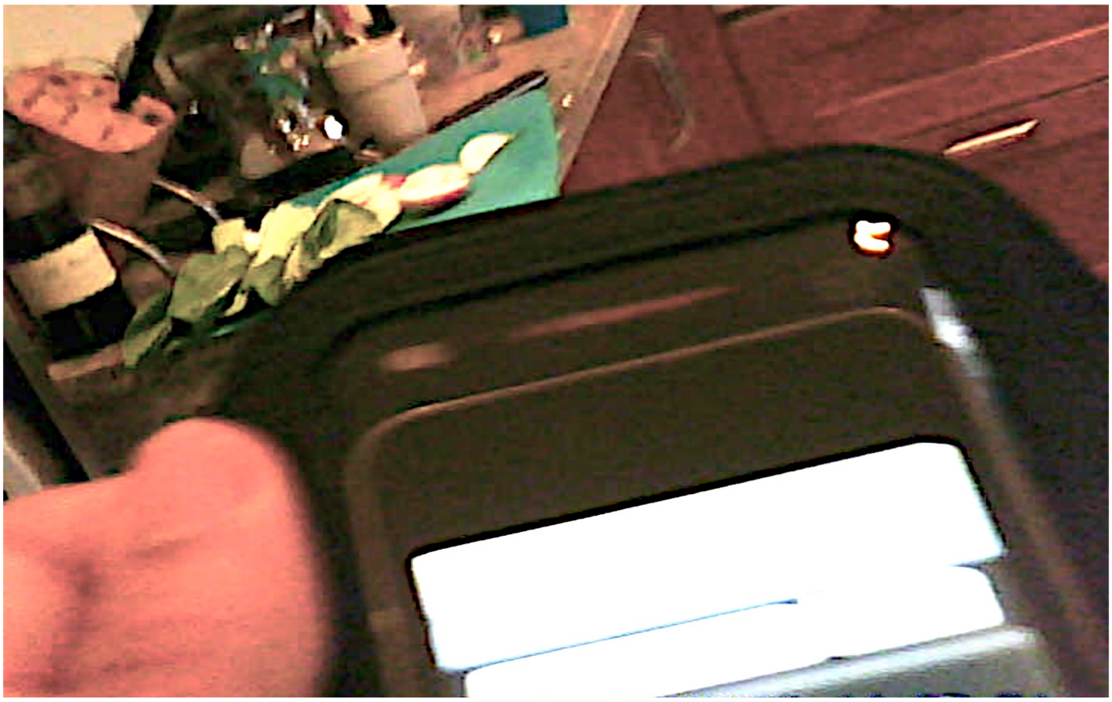


Figure 6.12. Negatively classified sessions with ME5 codes were full of distractions. In this example the user is preparing food whilst trying to watch video on their mobile.

Five sessions attracting ME5 codes were actually rated positively. Again some of these sessions (two) oscillated between ME5 and ME6 codes. These were Opportunist Planning situations out in public when the users watched on mobile devices. Despite the distractions of the environment these users were able to create entertaining experiences. Primarily this was through swift access to previously downloaded content and the use of headphones to drown out the background distraction and noise. Whilst interruptions were observed, these sessions felt very different to those that ended negatively. Primarily this was because it was apparent although out in public these users were attempting to create private spaces, and give their full attention to the content. This was in contrast to the negative sessions in which the users had clearly made decisions to carry out parallel tasks:

> *"This was an enjoyable watch. With my headphones on I felt disconnected from my surroundings."*

Other positive sessions with ME5 codes (3 of 5) exhibited a totally different class of viewing situation. Despite similar distractions and interruptions, these critically focused on the content rather than external events. One key example was a mum doing craftwork with her daughter at the kitchen table whilst watching Wonders of the Universe on an iPod (see Figure 6.13). They shared the headphones, (one bud each) and talked throughout about the content and the wider questions it raised.

Figure 6.13. Although conducting other activities, sessions attracting ME5 codes could still provide positive outcomes, especially if associated to conversation around content.

There were only a small number of negatively classified sessions with ME6 codes, (six in total). These consisted firstly of some of those sessions introduced earlier that oscillated between ME5 and ME6 codes and characterised by external interruption and parallel tasks (3 of 6). The other category of negatively classified sessions was wholly ME6. These followed the structure of sessions discussed in the device activity section, in which delays in reaching content experienced early in the sessions leads to users losing interest later (3 of 6).

Positively classified sessions attracting ME6 codes again fell into two categories. The positive oscillating sessions moving between ME5 and ME6, (2 of 16) and highly absorbing Quality Time and Self Indulgence sessions conducted wholly in ME6 (14 of 16). These examples were extended duration, big screen sessions on TVs and large PC monitors. Many users even adjusted their environment in preparation for viewing such as by switching the lights off to darken the room, (4 of 14). It's was clear in these sessions that users had made some prior choices to invest time and attention into the experience and offer over their full attention.

There were a number of (both positively and negatively rated) situations in which users switched between giving video their full attention (5 of the 10 sessions attracting ME5 and 22 sessions attracting ME6 codes). This explains why no statistical differences in code durations for ME5 and ME6 were seen between these sessions. Despite this finding, the qualitative video analysis did show users at their most engaged and absorbed in sessions coded wholly in ME6. It is perhaps significant those sessions only occurred in the home and (in 13 of 14 instances) in Quality Time and Self Indulgence Viewing Archetypes. Additionally, every one of these sessions occurred in the evening or in the day at the weekend.

Figure 6.14. Users created full screen experiences to which they committed their full attention. Some even altered the local environment, such as by turning the lights off.

6.4.4 Inter-personal interaction (II) – Codes by session outcome.

Frequency of codes (II)

Responses for relative frequency across inter-personal interaction codes are depicted in Figure 6.15. The most commonly coded instance was II0 – *No verbalisation.* Frequency rates for this code were higher in positively classified, compared to negatively classified sessions X^2 *(df1, n=268) =7.156, p=0.007.* In addition a number of other codes also achieve significant differences. Code II3 – *User comment content based*, achieved higher frequencies in positively rated sessions X^2 *(df1, n=40) =5.198, p=0.022, whilst* II7 – *User comment logistics based,* achieved higher frequencies in negatively rated sessions X^2 *(df1, n=55) =16.506, p= >0.001.*

Code II1 – *User phatic*, also achieved high frequency rates in positively classified sessions, however there were not enough examples in negatively rated sessions to allow further analysis.

There were no other significant differences in frequency rates between positive and negatively classified sessions across the rest of the inter-personal interaction scheme.

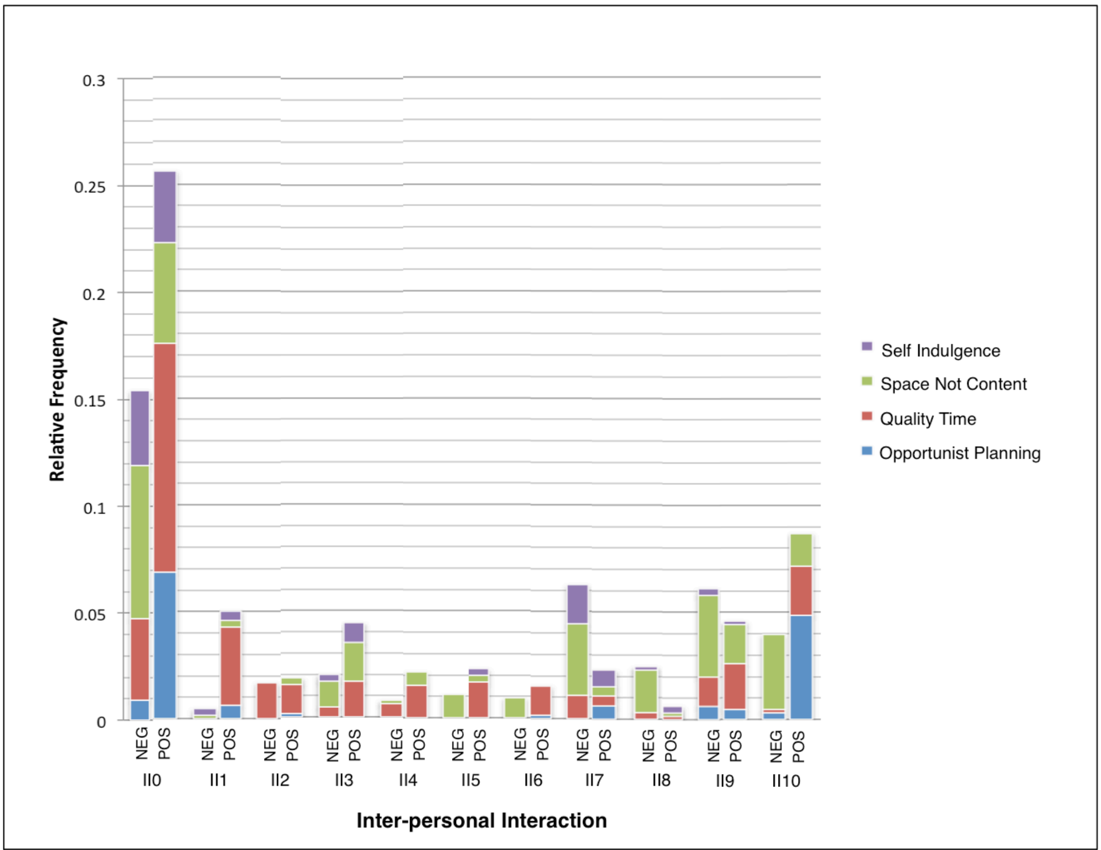


Figure 6.15. Inter-personal Interaction. Relative frequency of coded instances. Positively classified sessions versus negative. Breakdown by Viewing Archetype.

Code duration per instance (II)

Boxplots for durations per instance for II codes can be reviewed in Figure 6.16. The code with the longest duration per instance was II0 – *No verbalisation.* Other II codes generally had very short durations, (due to the natural turn taking of conversation) and therefore no significant differences in duration were found for any II codes.

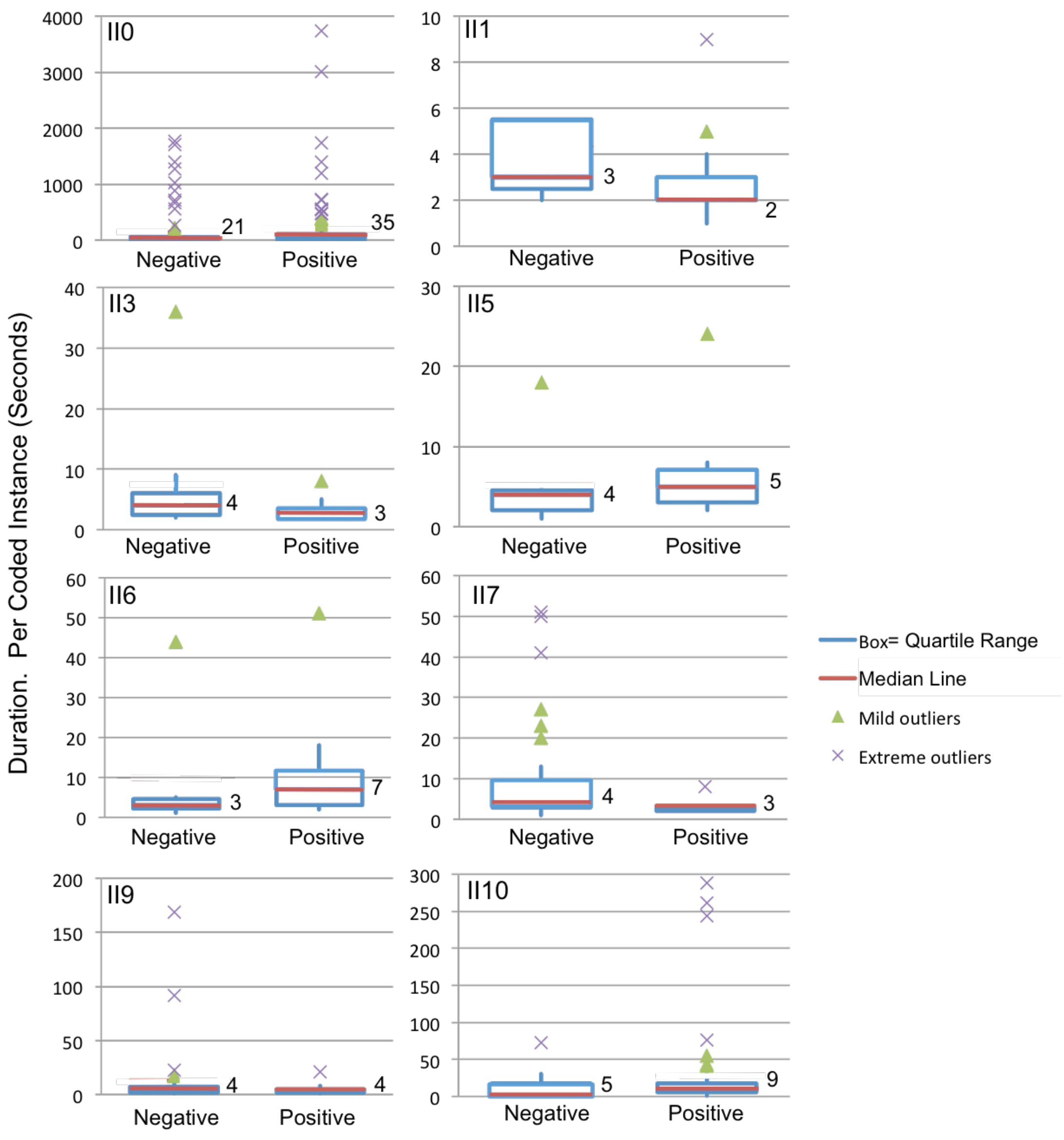


Figure 6.16. Inter-personal Interaction. Boxplots of average length of coded instance (seconds). Positively classified sessions versus negatively classified. (Not enough examples to compare II2, II4 or II8).

Code duration when all instances from a session are summed (II).

Boxplots for duration when all instances from a session are summed for II codes can be reviewed in Figure 6.17. II0 – *No verbalisation,* again achieved the longest average durations. For this code, differences in summed duration within positively rated *(M=2239 SD=1130.99)* sessions were significantly longer than in negatively rated *(M=986 SD=647.41), t(df30) =3.65, p = >0.001*.

In addition, summed II7 – *User logistical* provided much longer average summed durations in negatively classified sessions compared to positively classified sessions. However due to lack of examples a statistical analysis was not possible.

The fact that frequency of vocalisations around content (II3) was significantly higher in positively classified sessions, yet total summed durations per session for II3 had no association to the session outcome, was an interesting insight. Further analysis of the relationship between codes II3 and II4 is made in the qualitative analysis.

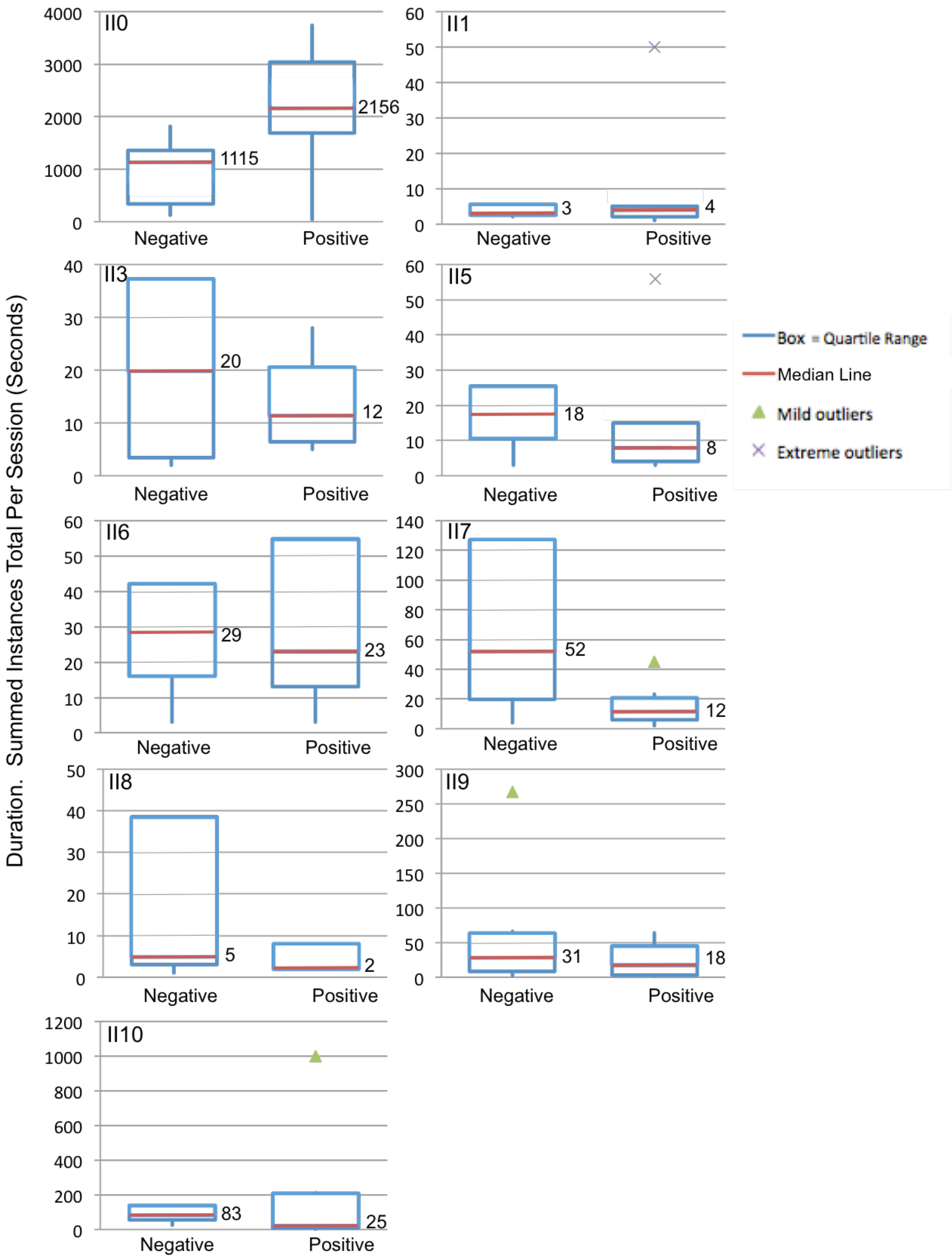


Figure 6.17. Inter-personal Interaction. Boxplots of average length of coded instance, summed by session (seconds). Positively classified sessions versus negatively classified. (Not enough examples to compare II2 or II4).

Observational insights (II)

Based on the insights from analysis of II code frequency and duration, sessions of interest were investigated in greater qualitative detail. Table 6.14 provides an overview of the codes to be analysed and justification for selection.

Code	No. Sessions	Reason for selection
II0 – *No verbalisation.*	32	Statistically significant higher frequency and longer durations of summed instances per session, in positively rated sessions.
II3 – *User Content-Based*	12	Statistically significant higher frequency of code in positively rated sessions.
II4 – *Other actor Content Based.*	5	Included in order to analyse content based conversations between the user and other actors.
II7 -*User logistical, (can you turn up the volume?)*	10	Statistically significant higher frequency of code in negatively rated sessions
II8 - *Other actor logistical.*	6	Included in order to analyse logistical based conversations between the user and other actors.

Table 6.14. Sessions with inter personal interaction codes selected for observational analysis.

II0 – *No Verbalisation.*

This analysis included 32 sessions, (18 of them positive). Table 6.15 provides an overview of the Viewing Archetypes these sessions were captured in.

Archetype	Positively Classified Sessions	Negatively Classified Sessions
Opportunist Planning	3	2
Self Indulgence	7	7
Quality Time	6	1
Sharing Space Not Content	2	4

Table 6.15. Sessions attracting II0 codes (by Viewing Archetype).

The mean summed duration per session of II0 was considerably longer in positively classified sessions compared to negative, (21minutes on average). A brief analysis of these sessions showed the amount of time without talking or verbal interaction correlated directly to the overall length of sessions. The delta in average length of positive to negatively rated sessions was 22 minutes. Just under half, (7 of 18) of the positively classified examples with II0 codes were conducted in Self Indulgence viewing situations. This is unsurprising as a significant number of these sessions achieved positive ratings and (by definition) were solitary experiences, limiting the opportunities for verbalisation. More surprisingly was the inclusion of six Quality time sessions. Despite a shared experience, conversation was very low once the sessions got underway and video was playing. Users did however appear very engaged with content and this was conveyed through sentiment.

"I love Horizon and really enjoyed this"

Three positively classified Opportunists Planning sessions also attracted long average durations of II0 codes. Conducted out in public but in differing physical contexts, (one on a train, one in a café and one in a waiting room) there were a number of consistencies between these sessions. Content was pre downloaded, (eliminating setup and buffering issues) and all the users wore headphones. Headphones obviously restricted the users opportunity for interaction and conversation.

II3 & II4 – *User Comment Content-Based and Other Actor Comment Content-Based.*

Analysis of sessions with II3 & II4 codes was carried out in parallel in order to contextualise the conversations between people in the viewing environment. The analysis included 12 sessions with II3 codes, (8 of them positive) and 5 sessions with II4 codes (4 of them positive). Table 6.16 provides an overview of the Viewing Archetypes these sessions were captured in.

II3 – User Comment – Content Based.		
Archetype	Positively Classified Sessions	Negatively Classified Sessions
Opportunist Planning	0	0
Self Indulgence	3	2
Quality Time	3	1
Sharing Space Not Content	2	1
II4 – Other Actor Comment –Content Based.		
Archetype	Positively Classified Sessions	Negatively Classified Sessions
Opportunist Planning	0	0
Self Indulgence	1	0
Quality Time	2	0
Sharing Space Not Content	1	1

Table 6.16. Summary of sessions attracting II3 & II4 codes (by Viewing Archetype).

The initial finding drawn from a review of the video data associated to these codes was the complex interplay between discussion topics. It was rare for comment or conversation to remain routed totally within the content and was observed in only one of the examples. Generally discussions widened to other contextually relevant subjects. As example, during Eastenders a participant and her flatmate talked over the enfolding storyline discussing the action, (content) but frequently jumped out to talk about the actors and the TV show more generally (context).

Flatmate:	*"Phil is going to kill her for that!"*
Participant:	*"If I was her, if I was acting with him I just couldn't take him seriously – also didn't he use to wear a hearing aid and now he doesn't have one? – that's bad continuity (laughs)"*

These types of discussion were seen during all three positively classified Quality Time sessions attracting II3 and II4 codes. These sessions represented a more social variant of the typically quiet and engaged Quality Time situations. Users still became involved with content but also chose to discuss it with others in parallel to watching. Similar positive examples of this behaviour were seen in the sharing space but not content Archetype (2 of 2). In these cases despite users in the environment not initially sharing viewing, through conversation they were drawn into a social experience.

Two less frequent scenarios were discovered amongst the negatively classified sessions with II3 and II4 codes. The first of these was vocalisation around content in order to distract children. These sessions showed parents attempting to watch content with small children who were disruptive or upset (2 of 4). Vocalisations around content were made in an (often unsuccessful) attempt to engage the child in the video. The second scenario (which was observed within both Self Indulgence and Sharing Space but not Content Archetypes), depicted family members entered the situation part way through viewing and engaging in short conversations (2 of 4). Far from adding to the experience, it was clear from observations that these interactions were perceived as interruptions, distracting users from the content.

<u>II07 & II08 - *User comment logistical, (can you turn up the volume?)* and *Other actor comment logistical.*</u>

Analysis of sessions with II7 & II8 codes was carried out in parallel in order to contextualise the conversations between people in the viewing environment. The analysis included 10 sessions with II7 codes, (6 of them positive) and 6 sessions with II8 codes (3 of them positive). Table 6.17 provides an overview of the Viewing Archetypes these sessions were captured in.

II7 – User Comment – Logistical.		
Archetype	**Positively Classified Sessions**	**Negatively Classified Sessions**
Opportunist Planning	1	0
Self Indulgence	2	2
Quality Time	1	1
Sharing Space Not Content	2	1
II8 – Other Actor Comment –Logistical.		
Archetype	**Positively Classified Sessions**	**Negatively Classified Sessions**
Opportunist Planning	0	0
Self Indulgence	1	1
Quality Time	1	1
Sharing Space Not Content	1	1

Table 6.17. Summary of sessions attracting II7 & II8 codes (by Viewing Archetype).

Unsurprisingly the amount of logistical vocalisation increased in sessions where the user experienced difficulties, and this was the main explanation for the increased frequency of II7 codes in negatively rated sessions. Interestingly, even in solitary Viewing Archetypes such as Self Indulgence, users chose to voice logistical considerations and actions aloud. In fact Self Indulgence situations were as well represented against these codes as situations with multiple actors present (2 examples of each). Negative sessions did not necessarily end without video being viewed. Often the user overcame their initial difficulty but (as noted in earlier sections) interest appeared to wane and early curtailment of viewing was common without any further interruptions to additionally explain a reason for stopping.

Both positively and negatively rated sessions attracted II7 and II8 codes and examples were seen across all viewing situation Archetypes (except Opportunist Planning). This suggests (since we know some users in Opportunist Planning situations did have problems) that whilst users were comfortable to vocalise their thoughts on logistical issues (even when alone) in private, they are not as forth coming when out in public.

As identified earlier in this section, increased frequency of II7 codes was associated with negatively classified sessions. Big differences were also seen in average durations of II7 codes when summed by session between positively and negatively rated sessions, (however the sample size was too small to allow a statistical analysis). This finding was independent of if the session also included conversation around context and content.

The nature of the logistical conversations varied by circumstance. Situations where content could not be accessed at all provided the most discussion (6 of 10). Conversations revolved around problem solving and (when alone) think aloud voicing of possible actions to take. It is important to note that at no point during the study were users instructed to talk aloud for the purposes of the data capture. It was also clear on review of the video (due to the presence of half sentences and talking under the breath) that problem-solving vocalisations were naturalistic. When two or more users were in the room, problem solving was shared. Even in Sharing Space but not Content Viewing Archetypes where the other person was not actually watching, the other actor was drawn into the problem solving activity. This happened in 2 of the 3 sessions attracting II7 and II8 codes. Beyond actually getting the content to play, other problem solving scenarios fostering logistical conversation included navigation issues (3 of 10) and control of the viewing window size (1 of 10).

Figure 6.18. During logistical conversations (II7 and II8) other actors in the environment often got involved in problem solving even when they were not watching themselves.

6.4.5 Personal Context (PC) – Codes by session outcome.

Frequency of codes (PC)

Responses for relative frequency across personal context codes are depicted below in Figure 6.19. Users rarely adjusted their personal contexts in most viewing situations so samples sizes for this scheme were low. This has limited the ability to conduct statistical analysis. The most commonly coded instance was PC2 – *User is sitting down (upright).* Relative frequency rates for this code were higher in negatively classified sessions compared to positively classified ones. It was a single Archetype (Opportunist Planning) that contributed substantially to the increases in PC2 codes from negatively rated sessions, however overall differences in PC2 frequency between positive and negatively rated sessions were not significant X^2 *(df1, n=26) =1.572, p=0.21.*

Despite other differences in frequency between positively and negatively rated sessions, (most notably PC3 - *User is sitting down – lean back*) in which higher frequencies of coding was achieved in positively rated sessions, sample size prevented analysis. However an interesting finding was that differences in frequency of PC3 between positively and negatively classified sessions could be attributed almost completely to Quality Time viewing.

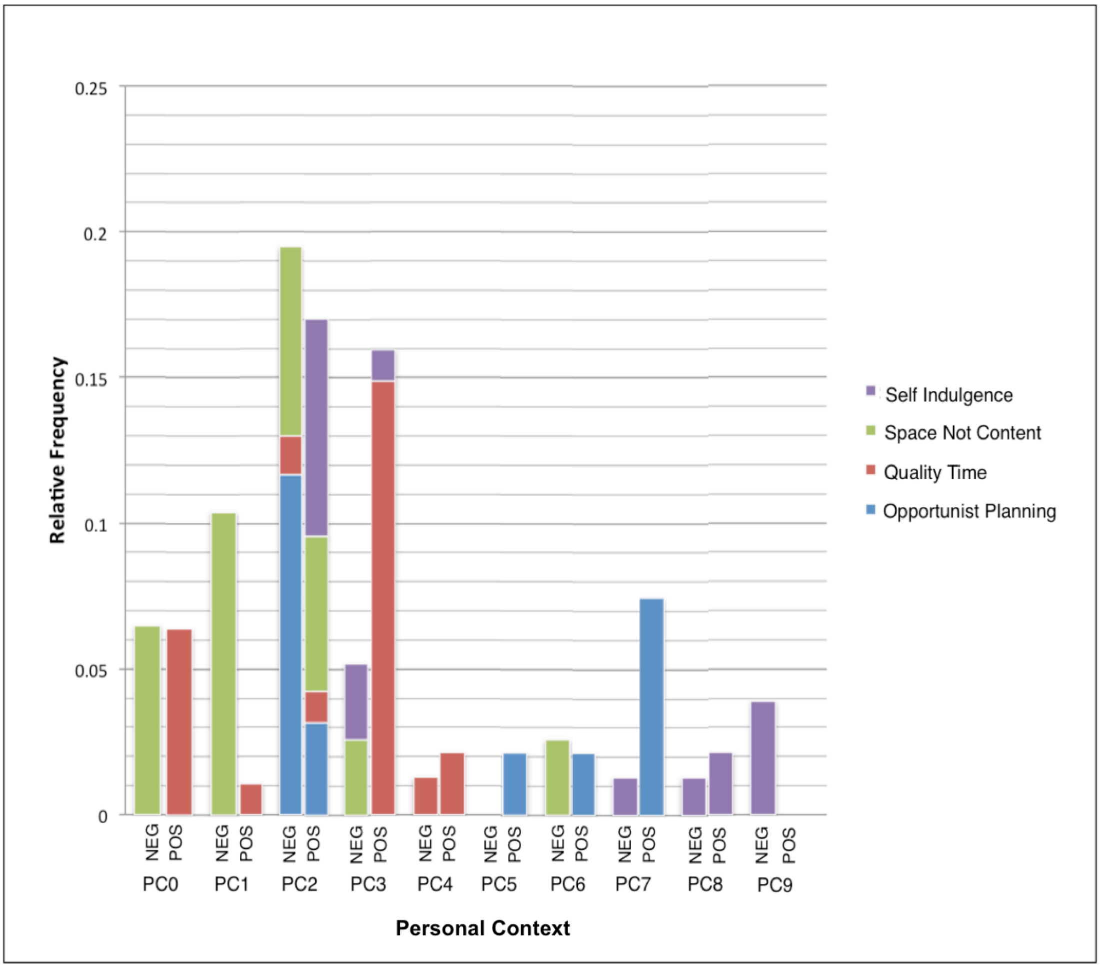


Figure 6.19. Personal Context. Relative frequency of coded instances. Positively classified sessions versus negative. Breakdown by Viewing Archetype.

Code duration per instance (PC)

Boxplots for average durations per instance for PC codes can be reviewed in Figure 6.20. The code with the longest average duration per episode was PC3 – *User is sitting down – lean back.* This code also showed large differences in duration between positively *(M=1458.9 SD=1196.42)* and negatively (*M= 281.46 SD=308.71*) rated sessions. However a small sample size prevented further analysis. PC2 – *User is sitting down sitting upright*, was the only code with enough data to allow statistical analysis. Differences in duration between positively rated (*M=1824.87 SD=1528.27*) and negatively rated (*M=1220.5 SD=534.59*) sessions showed significantly longer durations in positively classified sessions *t(df24) =3.673, p=0.001*.

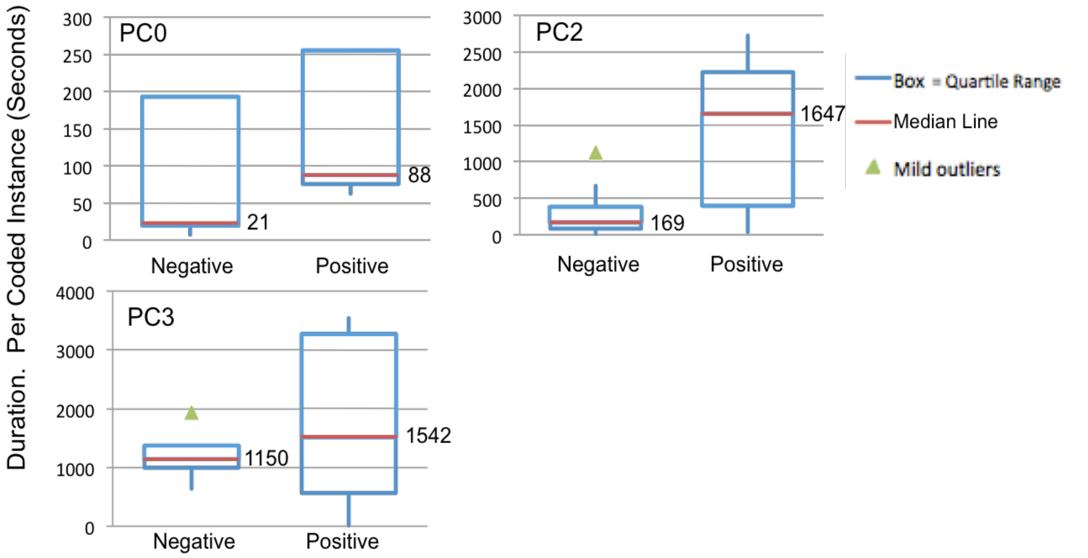


Figure 6.20. Personal Context. Boxplots of average length of coded instance (seconds). Positively classified sessions versus negatively classified. (Not enough examples to compare PC1, PC4, PC5, PC6, PC7, PC8 or PC9).

Code duration when all instances from a session are summed (PC)

Boxplots for duration when all instances from a session are summed for PC codes can be reviewed in Figure 6.21. Again PC3 – *User sitting down lean back* was the code with the longest durations. Summed duration responses for PC3 were longer in positively classified (*M=2919.8 SD=1234.83*) sessions compared to negative (*M=1627.33 SD=396.03*) but again sample sizes prevented further analysis. PC2 responses did however provide significant differences in duration between positively classified (*M=1816.44 SD=1094.71*) and negatively classified (*M=703.67 SD=733.56*) sessions *t(df13) =2.172, p=0.048*.

PC0 – *user is walking*, provided only marginal differences in summed duration between positively classified (*M=286 SD=192.33*) and negatively classified (*M= 226 SD=290.62*) sessions, and in fact for both individual instances and when codes were summed by session, duration of PC0 codes did not achieve any significant differences. This is a surprising finding as it would be reasonable to expect that periods of time spent walking around during viewing would have a detrimental effect on the viewing experience. These sessions will be investigated further in the qualitative data analysis.

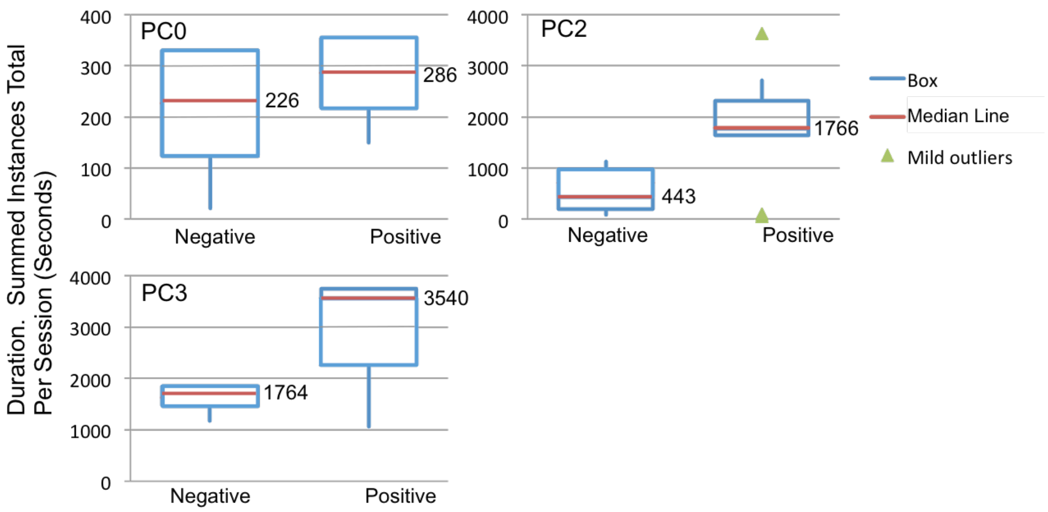


Figure 6.21. Personal Context. Boxplots of average length of coded instance, summed by session (seconds). Positively classified sessions versus negatively classified. (Not enough examples to compare PC1, PC4, PC5, PC6, PC7, PC8 or PC9).

Observational insights (PC)

Based on the insights from analysis of PC code frequency and duration, sessions of interest were investigated in greater qualitative detail. Table 6.18 provides an overview of the codes to be analysed and justification for selection.

Code	No. Sessions	Reason for selection
PC0 – *User is walking.*	4	To allow further investigation of the lack of impact on ratings of walking whilst watching.
PC2 - – *User is sitting down – upright.*	15	Statistically significant longer average duration of code instances and duration of summed instances per session, in positively rated sessions.
PC3 – User is sitting down – lean back.	8	Included due to large differences in duration although sample size not large enough to allow statistical analysis.

Table 6.18. Sessions with person context codes selected for observational analysis.

PC0 – *User is walking.*

This analysis included 4 sessions, (2 of them positive). Table 6.19 provides an overview of the Viewing Archetypes these sessions were captured in.

Archetype	Positively Classified Sessions	Negatively Classified Sessions
Opportunist Planning	-	-
Self Indulgence	-	2
Quality Time	2	-
Sharing Space Not Content	-	-

Table 6.19. Sessions attracting PC0 codes (by Viewing Archetype).

One of the few similarities between all the sessions that included PC0 codes was that they were conducted in the home. During the study people simply didn't watch video whilst walking around in public. Negatively rated sessions captured with PC0 codes once more showed parallel activities. Both examples depicted food preparation in the kitchen. Users were continuously walking around the space and frequently away from the screen. These sessions were both consumed on TVs meaning the user couldn't take the screen with them as they moved around.

Positively rated sessions captured with PC0 codes also occurred on televisions, however these were Quality Time situations and rather than parallel tasks these walking scenarios represented intervals. Content was paused and the user took their time (usually leaving the room) to prepare drinks or take a rest break. These actions explain the lack of difference in walking codes between positively and negative classified sessions as seen in the boxplots. Once settled back on the couch the content was restarted and the viewing experience picked up from where it was left.

Figure 6.22. During some Quality Time sessions, users paused content in order to take a comfort break or fix a drink.

PC2 & PC3 - *User is sitting down – upright, and User is sitting down – lean back.*

Analysis of sessions with PC2 and PC3 codes was carried out in parallel in order to compare and contrast the codes. The analysis included 15 sessions with PC2 codes, (9 of them positive) and 8 sessions with PC3 codes (5 of them positive). Table 6.20 provides an overview of the Viewing Archetypes these sessions were captured in.

PC2 – User is sitting down - Upright.		
Archetype	**Positively Classified Sessions**	**Negatively Classified Sessions**
Opportunist Planning	1	3
Self Indulgence	5	0
Quality Time	1	1
Sharing Space Not Content	2	2
PC3 – User is sitting down – Lean back.		
Archetype	**Positively Classified Sessions**	**Negatively Classified Sessions**
Opportunist Planning	0	0
Self Indulgence	1	2
Quality Time	4	0
Sharing Space Not Content	0	1

Table 6.20. Summary of sessions attracting PC2 & PC3 codes (by Viewing Archetype).

Negatively rated sessions attracting PC2 codes – *User is sitting down upright* occurred either outside in mobile environments (2 of 6), or when the user watched on a computer at a desk, either in a home office or at work (4 of 6). These sessions all included either a technical issue resulting in a lack of access to video, or examples of parallel activity. This to a large extent explains the shorter duration of PC2 code instances in negatively rated sessions, as both the lack of video and presence of parallel tasks was associated to shorter sessions.

The link between longer summed duration of PC2 codes and positively rated viewing was through a number of sessions depicting highly engaged self-indulgence sessions on desktop computers with larger screens (5 of the 9 positively rated sessions). As noted earlier these sessions appeared close to Quality Time situations in terms of duration and user involvement. However a difference with these sessions was that they were carried out sitting in a desk chair (in front of the home PC), rather than in the lean back scenario of the sofa as seen in Quality Time. This difference did not however seem to effect ratings for user satisfaction and UES within these sessions.

Figure 6.23. Users could create engaging and enjoyable solitary experiences at home sitting at their computer desks.

All of the sessions featuring PC3 codes – *user is sitting down, leaning back,* occurred in the living room on the sofa or in an armchair. Negatively rated sessions attracting this coding all encountered some form of setup or navigation issue (3 of 3). Again interestingly all of these sessions consisted of solitary viewing, (Self Indulgence or Space Not Content Viewing). In contrast all but one of the five positively classified sessions with PC3 codes were captured in Quality Time situations. These were all long duration sessions and consisted of both classes of observed Quality Time viewing (focused and social viewing).

6.4.6 Analysis of content.

An analysis was made of the content watched during the sessions in order to investigate the extent to which the reasons for particular ratings may have been influenced by content selection. Taking a pragmatic view it is fair to assume that users would generally have chosen to watch something perceived as interesting. It could therefore be expected that content choices that turned out to be a cause for disappointment would manifest as negative comments in the associated sentiment verbatim. Analysis of the verbatim showed only five statements collected from the questionnaires categorised as relating to content. Of these only one of the comments was negative in sentiment and additionally came from a session that attracted negative ratings. Even in positively rated sessions, users frequently used the verbatim to recap on a range of both positive and negative aspects surrounding the experience. A breakdown of the verbatim related to content is provided in Table 6.21.

Session ID	Viewing Archetype	Verbatim
333	Opportunist Planning	"Stimulating show"
512	Quality Time	"I love Horizon"
422	Self Indulgence	"Exciting, loved the program"
172	Space Not Content	"Enjoyed the football"
261	Space Not Content	"Miserable – the show was rubbish"

Table 6.21. Summary of sessions verbatim attracting comments about content.

In the remaining verbatim a number of other comments were captured citing a range of influencers on the experience. An analysis of the themes captured in the verbatim, the sentiment of the comments, and the resulting session ratings is provided in Figure 6.24.

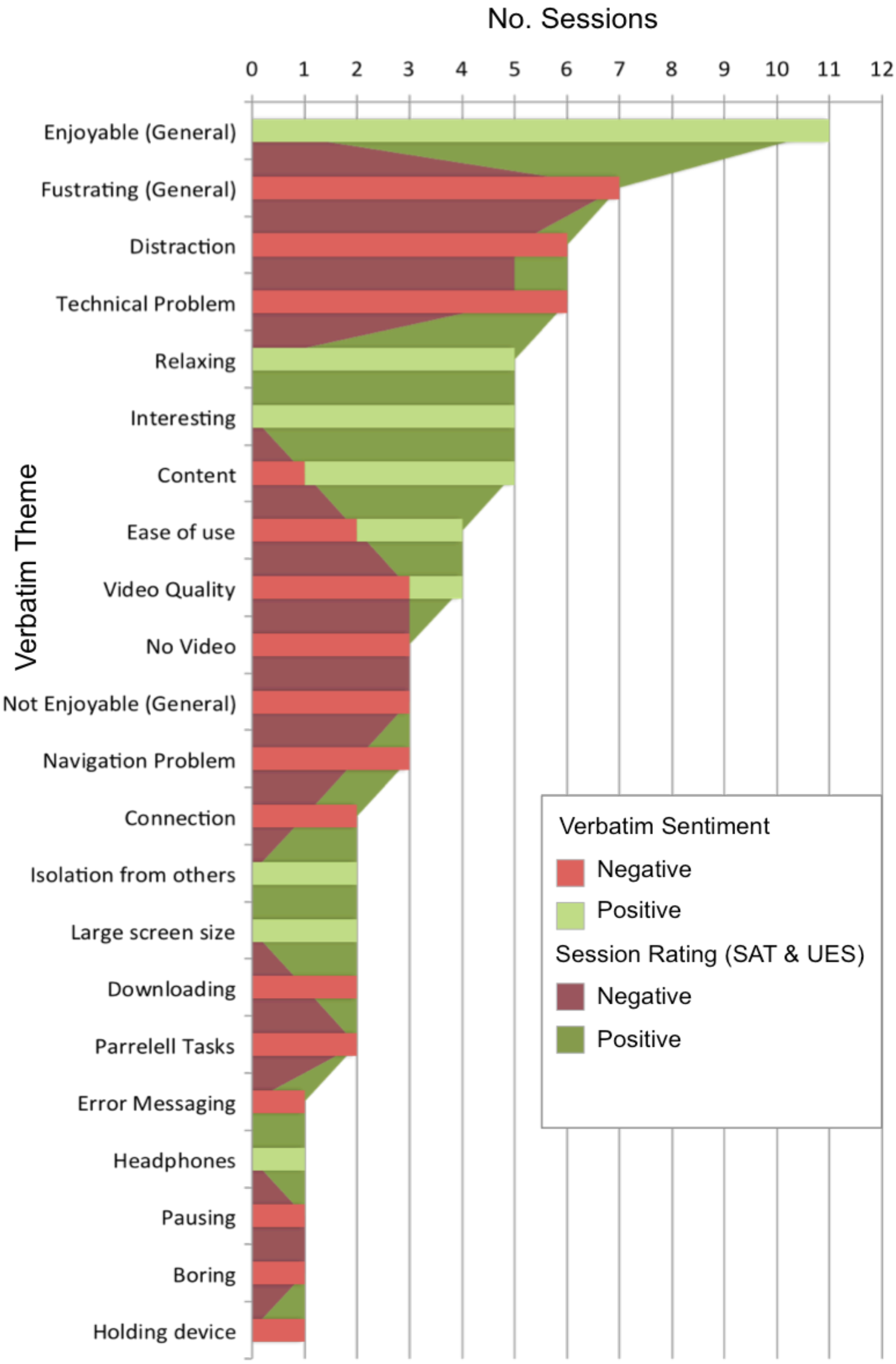


Figure 6.24. Analysis of verbatim themes and sentiment in order to understand influencers on sessions ratings.

A further analysis was carried out to investigate both genre selection and content running time in relation to ratings. Figure 6.25 provides a breakdown of genre (as specified by IMDB[5]) in relation to session rating. This analysis showed a slight preference for documentary content (chosen by users in 25% of all sessions). Interestingly many of the positively rated content examples of this genre were highly visual in nature, (Wonders of the Universe, Horizon and Tropic of Cancer) and were watched in Quality Time and Self Indulgence viewing situation Archetypes.

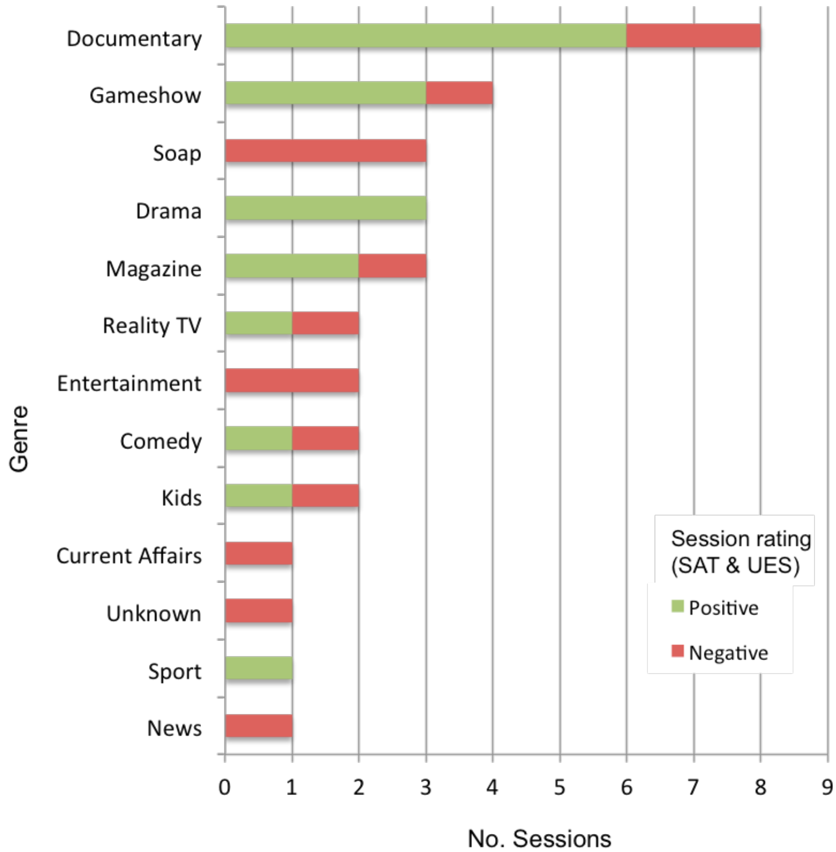


Figure 6.25. Analysis of content genre in relation to session ratings.

The second analysis investigated the relationship between content running time and rating. A boxplot for content running time in relation to session rating can be reviewed in Figure 6.26. Due to the standard broadcast durations, positively rated session duration (Mdn = 40 minutes) and negatively rated sessions (Mdn

[5] *http:www.IMDb.com*

=30 minutes) showed no significant differences in the running times of the programmes watched *U=79, p=0.074*.

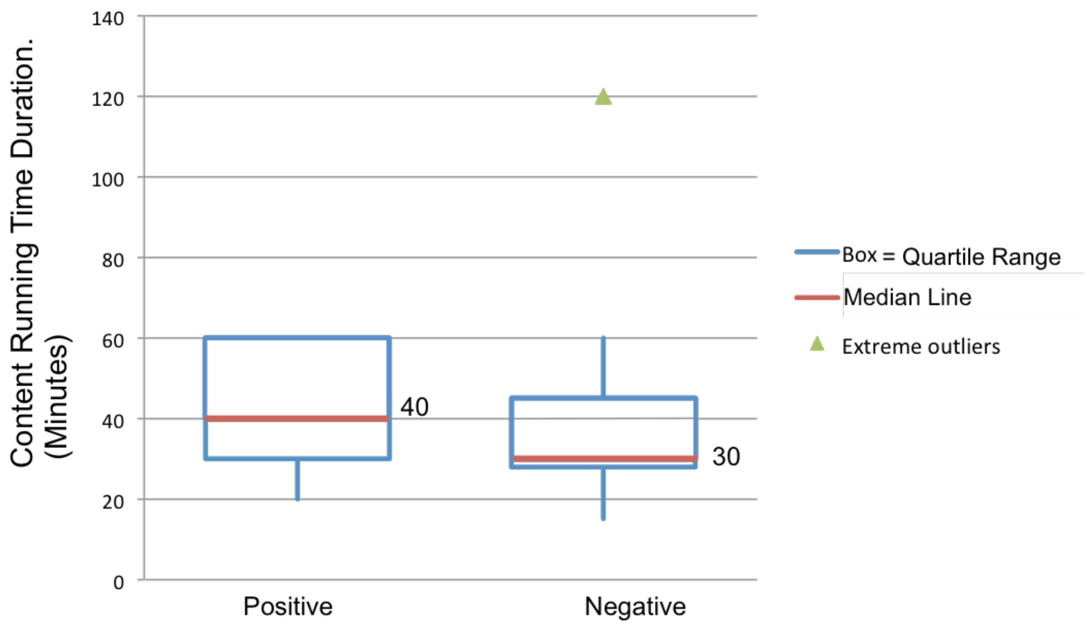


Figure 6.26. Content Running Time. Boxplot of published content durations, (minutes). Positively classified sessions versus negatively classified.

Comparing content running time in individual sessions to the duration actually watched provided an indication of if the session was ended early or watched until the end. A breakdown of the frequency of how each session ended is provided in Figure 6.27. A further breakdown is provided in Figure 6.28 of the frequency of sessions that ended early by Viewing Archetype. This data shows that over 83% of sessions when content was watched to the end credits was rated positively, and 80% of sessions that ended early were rated negatively. As so few sessions that were watched to the end received negative ratings, further analysis wasn't possible due to the lack of sample size.

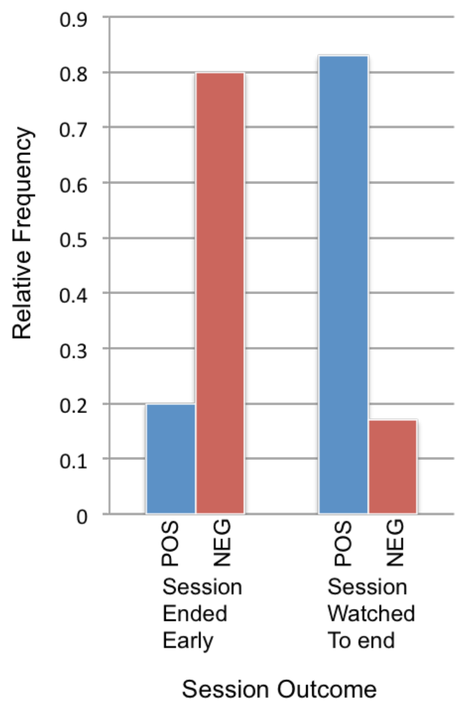


Figure 6.27. Relative frequency of session outcome based on if session was ended early or content was watched to the end. (Positively classified sessions versus negative).

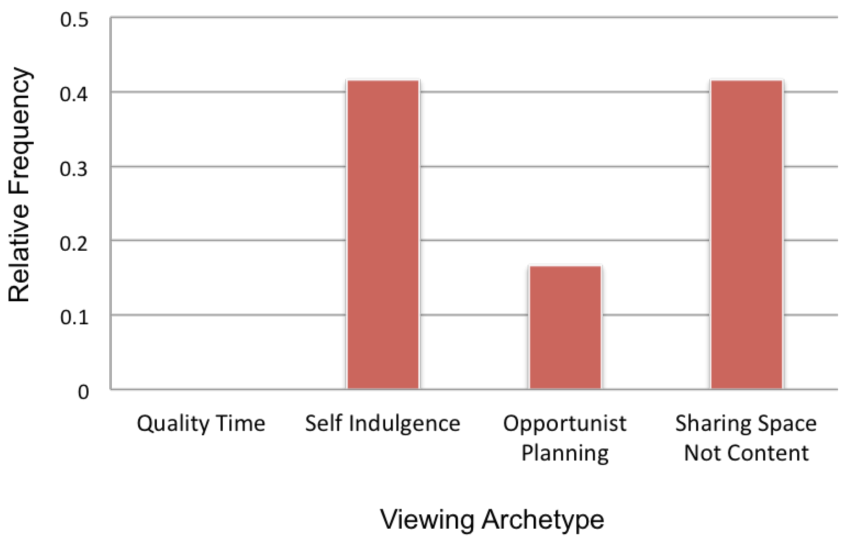


Figure 6.28. Relative frequency of session outcome based on if session was ended early. (by Viewing Archetype).

A final analysis on content selection is represented in Figure 6.29. This depicts the running times of the content selections made in relation to the Archetypes in which they were watched. Even though Opportunist Planning situations tended to be severely constrained by environmental temporal factors, users still chose to watch long running content, (with a third of selections in that Archetype lasting 40 minutes or over). Both Self Indulgence and Quality Time viewing situations when users were watching at home in private attracted content selections with running durations right across the spectrum from very short form content to long dramas of over an hour. This analysis suggests users watching in different Viewing Archetypes appear to take little consideration of running time when making content selections.

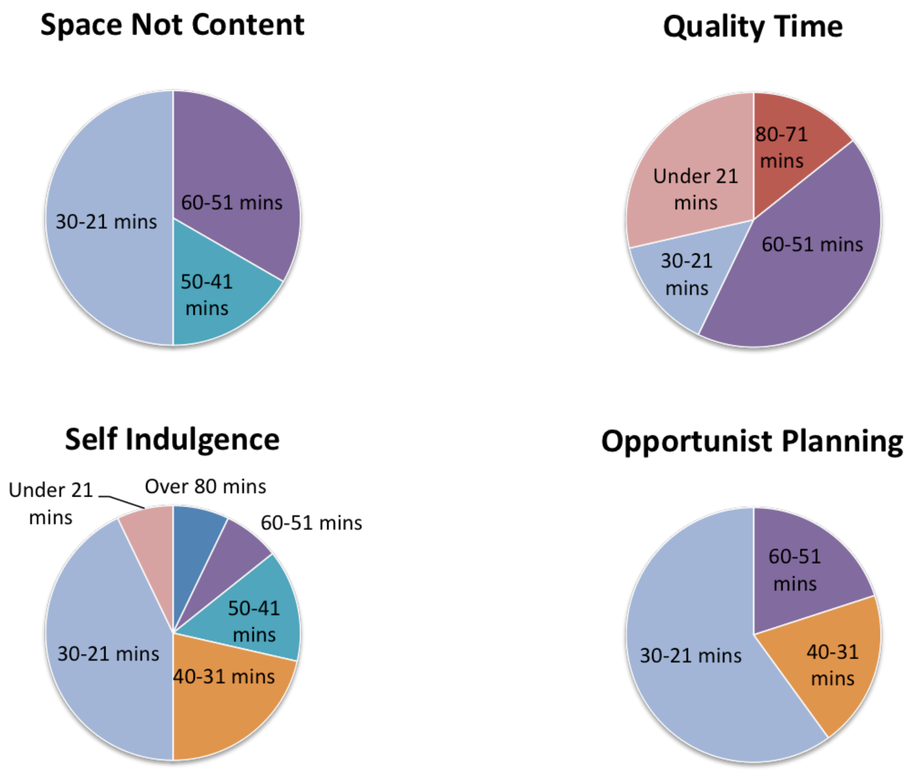


Figure 6.29. Analysis of content running time in relation to Viewing Archetype.

6.5 Discussion

The study executed a number of research activities focused on the core aims of identifying the experiential factors that help explain both the high and low ratings for satisfaction and UES that the sessions under investigation received. Within this section some of the factors identified from the study will be introduced and described. Some are supported by previous literature and others are newly reported in this study.

A general comment on the factors identified was that they were observed to relate to both issues outside the control of the user and issues encountered due to the user's own behaviour. This categorisation is summarised in Table 6.22. It appears logical to classify the factors in this way as this information may influence both the appropriate ways a future system might identify the factor within the viewing experience and also the action which needs to be taken to improve the experience.

Theme	User Control	Description
System Issue	Outside the users control	A technical or usability related factor associated with the video application or consumption device that influenced the UX.
Environmental Issue	Outside the users control	A factor within the viewing environment unrelated directly to the user or the technical system that influenced the UX.
User Behaviour	Within the users control	An action, behaviour or decision taken by the user than influenced the UX.

Table 6.22. Classification of experiential factors.

6.5.1 Experience Detractors (Negative Factors).

Noted below are the experiential factors identified through the study as detracting from viewing UX. This has been concluded from their frequency and duration in negatively rated sessions.

Distraction and interruption

Many circumstances were identified during the study where the user could not give their full attention to the content. Aspects of the environment, including visual and auditory distractions and other people diverted the user's attention from the consumption experience.

This pattern was observed to affect the viewing experience in all Viewing Archetypes except for Opportunist Planning. Whilst sources of distraction were inherent within Opportunist Planning environments users had strategies to deal with the issues of interruption. They achieved this primarily by choosing to wear headphones to block out distractions and maintain focus on content.

Interruptions and distraction where identified through oscillations in the media engagement codes of ME5 – Device video is the only media, but video consumption is a secondary activity, and ME6 - Device video is the only media and video consumption the only action throughout a session, (see negative examples depicted in Table 6.13). Sessions with this coding pattern attracted higher rates of negative ratings than those only with ME6 codes. This categorisation is summarised in Table 6.23.

The concept of cognitive information processing (Meyer & Kieras, 1997) is relevant when considering the impact of interruption and distraction on viewing. There are likely limits to just how much attention a person can pay to one task when multiple things are happening (Just et al., 2001). Bergen, Grimes and Potter (2005) suggest when multiple channels of semantically different information are provided, viewers find it difficult to focus on both sources and recall less information. This therefore suggests that user strategies to reduce distraction observed in Opportunist Planning situations are attempts to reduce information 'bandwidth' and focus attention on the content.

The behaviours seen in this study have been previously identified in the literature. O'Hara et al. (2007) described users using headphones to create privacy in public spaces, and Repo et al. (2004) the user behaviour of "averting face" where users altered their physical posture to block out distractions and avoid irritation from others. This study found that in some of these scenarios such strategies were indeed able to block out the environmental distractions and therefore users could still focus on content and achieve positive viewing experiences.

Experience Detractor	Classification	Indication	Viewing Archetype Presence
Distraction and interruption	Environmental	Oscillation between ME5 and ME6 codes throughout the session.	Quality Time Sharing Space Not Content Opportunist Planning* Self Indulgence.

*Table 6.23. Summary of "Distraction and interruption" detractor. *Oscillating ME5 / ME6 codes not valid indicator in Opportunist Planning sessions if user using headphones.*

Unrelated parallel tasks

Sometimes parallel distractions diluted the user attention given to the video for the whole duration of the experience. Generally conducting parallel tasks whilst attempting to watch was observed as detrimental for the viewing experience (see Figure 6.12). Activities fitting this pattern included users answering phones, cooking, tidying up and attending to children, all whilst attempting to watch video. This categorisation is summarised in Table 6.24.

These behaviours were identified in all Viewing Archetypes, however a consistently observed example of this behaviour came from Self Indulgence situations. This was when users watched on a PC whilst conducting other computing tasks that relegated the video to a pop up window on the screen.

The significant presence of ME5 codes throughout an experience represented the splitting of attention and a focus on parallel tasks. The only parallel distractor that did not contribute to a negative experience outcome (which was observed in some shared viewing situations) was conversation about the content (this is discussed in section 6.5.2). DA7 – *user watched in a window,* was the core indicator of parallel tasks on the computer, as only those users who set out to complete parallel computing tasks watched whole sessions in a window rather than transiting to full screen early in the session. Sessions conducted wholly in DA7 generally ended before the content finished (only one of these six sessions was watched to the end). This was also an indicator of a poor experience because as discussed in the results, 80% of sessions ending early were rated negatively (see Figure 6.28).

The observed behaviour of users conducting parallel tasks in front of video is well document in the literature. This includes descriptions of people using the TV as a background companion through the day (Gauntlett & Hill, 1999) and in more recent studies attempts have also been made to quantify the amount of attention users give to video in relation to other parallel activities, (Saxbe et al., 2011), (Holmes, Papper, Popovich, & Bloxham, 2005). Commentators have speculated that during multi-tasking the quality of the media exposure must be lower as audiences are only paying a fraction of their attention to the content (Nightingale, 2004). Therefore this must limit not only attention but also comprehension of the content (Jeong & Fishbein, 2007). However to the author's knowledge there have not been any studies explicitly addressing the presence of parallel tasks in relation to enjoyable viewing experience outcomes. The findings from this study suggested that multi-tasking by carrying out parallel tasks unrelated to the video content detracts from the perceived viewing experience.

Experience Detractor	Classification	Indication	Viewing Archetype Presence
Unrelated parallel tasks 1. (off computer)	Behavioural	Session watched continuously in ME5 – Video is the only media but viewing is a secondary task	Quality Time Sharing Space Not Content Opportunist Planning Self Indulgence.
Unrelated parallel tasks 2. (on computer)	Behavioural	Session watched continuously in ME5 - Video is the only media but viewing is a secondary task	Self Indulgence.
		Session watch continuously in DA7 – user watched in a window.	

Table 6.24. Summary of "Unrelated parallel tasks" detractor.

No video

Although it may appear obvious, time spent within the viewing session without video content playing detracted from the experience. Most causes for why video wasn't being played revolved around users having technical problems getting video to play, and this therefore represented a key reason for why a lack of video led to poor ratings. This categorisation is summarised in Table 6.25.

This appeared a hygiene factor in all Viewing Archetypes and only in some very specific Quality Time sessions (in which the users paused content to make drinks or take rest breaks) did a lack of video not contribute to a negative rating.

Summed durations of ME0 codes – *video not present*, were the key indicator of this factor with significantly longer durations in negatively rated sessions (see results on page 217). Apart from the taking a break scenario noted above, all other sessions incurring over 200 seconds of ME0 code were rated negatively.

An additional related cue was DA4 – *Waiting for content.* Summed durations of this code were also significantly longer in negatively rated sessions. This was indicative of streaming and buffering problems throughout the experience. This again appears a hygiene issue and not a single session in any Viewing Archetype with over 30 seconds total buffering time achieved a positive rating.

These findings are consistent with quality of service investigations in the literature. Dobrian et al. (2011) found the ratio of buffering in a session in comparison to the video played was the video quality metric which most impacted user engagement (their definition), and that for every 1% increase in buffering ratio they saw a 3 minute decrease in sessions duration.

Experience Detractor	Classification	Indication	Viewing Archetype Presence
No video	System	ME0 – video not present: Longer summed total durations	Quality Time* Sharing Space Not Content Opportunist Planning Self Indulgence.
		DA4 – Waiting for content: Longer summed total durations	

*Table 6.25. Summary of "No Video" detractor. *ME0 codes not valid indicator in Quality Time sessions due to observed behaviours of users taking "intervals".*

Delays in setting up

Although many errors and difficulties prevented video from being played, there were also a number of other scenarios in which technical or usability issues only delayed initial access to video rather than prevented viewing from happening at all. Core examples included extended attempts to connect to Wi-Fi and an inability to locate a specific piece of content in the user interface menus. This categorisation is summarised in Table 6.26.

This issue was observed to affect all four of the Viewing Archetypes investigated and sessions with negative ratings and long delays in set up were captured in every Archetype during the study.

These issues were manifest by long DA2 - User is preparing to watch video codes, and particularly a small number of outlier individual code instances, (100 seconds and over - see Figure 6.3). DA2 summed per session durations were on average over 3 times longer in negatively classified sessions compared to positive ones. As a general observation, device activity codes related to any aspect of setting viewing up (DA2, DA3 and DA4) achieved longer average summed durations in negatively rated viewing (see Figure 6.4).

A contributing issue observed from the video footage was that on many of the devices, (particularly games consoles and mobile devices) the initial setup investment to prepare the device for video and then find content was high. Taylor and Harper (2003) described users naturally falling into content discovery mechanisms that represented the least cognitive effort. Even moving from channel surfing to using an EPG represented a perceived increase in cognitive load. Schmutz, Heinz, Metrailler and Opwis (2009) found higher cognitive loads during ecommerce content search tasks negatively impacted user satisfaction. Within this study, if after attempting to play video the user incurred a problem, even the simplest of problem solving options, (e.g. switching off and on again) created a laborious user process. As these actions (even when successful) further increased both the time taken to reach content and cognitive load, these factors appear to be key contributors to longer duration times when setting up.

Experience Detractor	Classification	Indication	Viewing Archetype Presence
Delays in setting up	System	DA2 – user is preparing to watch: Longer individual instance and summed total durations	Quality Time Sharing Space Not Content Opportunist Planning Self Indulgence.

Table 6.26. Summary of "Delays in setting up" detractor.

Dealing with errors

When things did go wrong, (apart from increasing the time taken to reach content – see above) observations from the video data showed that meaningful messaging and guidance on fixing problems was lacking. This left non-technical users confused and unable to problem solve. As noted in the last detractor description, errors occurred in all Archetypes, however the signifiers were different. This categorisation is summarised in Table 6.27.

The issue was manifest in private situations through logistical conversation and comment. The frequency of II7 codes - *User comment logistical,* was significantly higher in negatively rated sessions compared to those rated positively (see Figure 6.15). However this was not the case in Opportunist Planning Archetypes outside the home where users obviously felt uncomfortable publically vocalising there issues. It could be hypothesised that difficultly in dealing with errors represents an extension to delays in setting up detractor. In such situations the negative impacts on experience being created by high cognitive loads and in some cases failure to successfully view video. Dewitte, Pandelaere, Briers & Warlop (2005) suggest that high cognitive load has long reaching after effects on decision making and perception. Episodes such as dealing with errors may therefore go on to cloud the whole experience even if the user solves the issue.

Experience Detractor	Classification	Indication	Viewing Archetype Presence
Dealing with errors	System	II7 – user comment, logistical: Increased frequency. DA2 – user is preparing to watch: Longer individual instance and summed total duration	Quality Time Sharing Space Not Content Opportunist Planning* Self Indulgence.

*Table 6.27. Summary of "Dealing with errors" detractor. *II7 codes not valid indicator in Opportunist Planning sessions due to user's observed reluctance to comment in public.*

Ending sessions early

In many scenarios where users incurred difficulties, even if overcame, there was a greater chance that the viewer would subsequently cut the session short. Initial user intent and investment at the start of sessions appears a key component of creating positive viewing experiences. This categorisation is summarised in Table 6.28.

However there were critical differences in user behaviour between viewing situations. Users were observed winding up sessions early after problems only in those situations where they watched alone (see Figure 6.28). This finding suggests the lack of a fellow viewer may contribute to making it easier to relax the commitment to the on going experience and bring the session to an end. One further aspect of note in relation to this detractor is the importance of planning. A number of Opportunist Planning sessions were cut short by environmental aspects, (examples included the end of lunch work breaks and trains arriving at the user's station). However users appear to make little allowance in their content choices for the situations they watch in and therefore inadvertently increase the chances of the experience being cut short (see Figure 6.29).

Ending sessions early does appears an indicator of negative experience, however in this study the sample size was not large enough to confirm this as not enough positively rated sessions ended early to allow statistical comparison (80% of sessions that did end early were negatively rated, see Figure 6.27). Additionally, whilst viewing alone in this context is not a detractor in it's own right, it does appear to impact user decisions about winding up viewing or not.

The behaviour of winding sessions up early by choice has many similarities to Wonneberger, Schoenbach and van Meaurs' (2009) process model of sequential-viewing in which the user continuously evaluates whether to continue the experience, search for new content or stop viewing. This process appears much more apparent when viewing alone.

The behaviour of not considering content length when watching in Opportunist Planning situations differs from some of the findings documented in the literature. Södergård (2003) found users watched different (and shorter) content on mobiles, Orgad (2006) envisaged mobile TV would be for 'snacking' on short content and Vorbau et al. (2007) suggested users plan their viewing on mobiles, deferring viewing in situations where the chances of finishing content is unlikely. Although (due to the use of BBC iPlayer as the source) the options to access shorter content were reduced in this study, iPlayer does still offer some short form content. However the majority of users selected full-length programmes. This finding aligns with the field trial results of Mason (2006) and Kim (2006), and the contextual research of O'Hara et al. (2007) in which users preferred to watch traditional TV shows on mobile of 30 minutes duration or more.

Experience Detractor	**Classification**	**Indication**	**Viewing Archetype Presence**
Ending sessions early	Behavioural, Environmental & Technical	Session ending before content ends.	Sharing Space Not Content Opportunist Planning* Self Indulgence.

Table 6.28. Summary of "Ending sessions early" detractor.

6.5.2 Experience Enablers (Positive Factors).

Noted in this section are the experiential factors identified through the study as enabling positive viewing UX. This has been concluded from their frequency and duration in positively rated sessions.

Conversation about the content

Increased frequency in comment regarding the content during a session was associated with positive ratings. Even when these conversations were observed to divert the user's attention away from content, such sessions still enjoyed positive ratings. This finding was only valid if the user made the comments. Verbal intrusions from other actors outside the viewing experience were not convivial to positive ratings and were as disruptive as other forms of interruption. Additionally the verbal content in positive sessions was between adults, rich and conversational. This differed from content discussion in front of children's programmes and shared between parents and young people. These conversations were primarily concerned with keeping the child engaged. This categorisation is summarised in Table 6.29.

This enabler was observed in all Viewing Archetype situations shared between adults, except for Opportunist Planning. Insight from exit interviews suggest this is due to user reluctance to comment in public (especially as Opportunist Planning was a solitary experience).

Whilst the presence of logistical conversation (II7) signified the user was having some form of difficulty, discussion around content (II3) was typically socially rich, and conversationally stimulating or humorous in nature. This finding agrees with much of the literature around everyday use of television in the home. Gauntlett and Hill (1999) identified that watching television was influenced by social interaction. Bernhaupt et al. (2008) notes that TV remains a rich social activity that allows people to be together. Within this study social interaction in front of video appeared to augment some viewing UXs leading to positive experience ratings, but conversely distance users from deeper attention to the content itself.

Experience Enabler	Classification	Indication	Viewing Archetype Presence
Comment around content	Behavioural	II3 User comment – content: Increased frequency.	Quality Time Sharing Space Not Content* Self Indulgence. **not valid when watching children's programmes with young people.*

Table 6.29. Summary of "Comment around content" enabler.

No verbalisation

A lack of utterance throughout a session also indicated a specific type of experience. The lack of verbal utterance was indicative of positive experience and represented a consistent focus by the user upon the content. This categorisation is summarised in Table 6.30.

Both within highly engaged Quality Time viewing and Opportunist Planning viewing outside the home (due to headphone usage and perhaps social norms) verbal utterances were kept to the very minimum.

There were significantly higher frequencies of II0 – No verbalisation codes in positively rated, compared to negatively rated sessions (see Figure 6.15). Additionally, the average duration of summed II0 code across a viewing experience were also significantly longer in positively rated sessions (see Table 6.15). Both this enabler and the much more social comments around content (described previously) occurred in Quality Time Archetypes, and each represents a different class of positive shared viewing experience.

This finding builds on Taylor and Harper's (2003) model of viewing in the home, suggesting the separation they propose between mid evening social viewing and later evening engaged viewing may have become blurred with the advent of ubiquitous video on demand and a move away from broadcast schedules. Based on this finding it is justifiable to consider two key experience episodes as being undertaken within the Quality Time Viewing Archetype, a shared highly social mode of viewing and also a much less social yet highly engaged mode (see section 6.5.3).

Experience Enabler	Classification	Indication	Viewing Archetype Presence
No verbalisation	Behavioural	II0 – No verbalisation: Increased frequency and longer summed total durations	Quality Time Sharing Space Not Content Opportunist Planning Self Indulgence.

Table 6.30. Summary of "No verbalisation" enabler.

Watching until the end

Sessions in which content was consumed to the closing titles were indicative of positive experiences. There was an obvious link between incomplete viewing and technical issues that shorten sessions. However there were additional behaviours observed of users choosing to end sessions early by choice or being forced to end early due to environmental constraints. Therefore actually reaching the end of a piece of content suggests both that the user avoided any critical technical, usability or environment issues and was also interested enough in the content to see the video out to end. This categorisation is summarised in Table 6.31.

This behaviour was observed in all of the Viewing Archetypes, however it must be noted that cutting a session short in Opportunist Planning due to environmental constraints did not automatically result in negative ratings. Users had some understanding of the conditions they were watching under and as long as it was their decision to end the session, (and not due to a technical error) they could still perceive experiences as enjoyable and worthwhile even if they did not complete viewing to the end titles.

Over 80% of all the experiences in which the user watched until the end attracted positive ratings.

These insights provide interesting information in relation to the design of implicit feedback for video content recommenders. Studies such as Zibriczky, Hidasi, Petres and Tikk (2012) consider the watched duration as an implicit preference. However they struggle to model the real user perceptions towards content based on if a session was cut short, content watched to the end, or perhaps the video was left to run unattended. As an example in Zibriczky et al., the authors included content watched for over 5 minutes as an implicit positive rating but removed ratings after which three user interactions with the system had been made due to the danger of including data where the user was no longer watching. The findings from this study suggests a more accurate model could be built by using real user viewing behaviour tied to explicit ratings as rules input into such models.

Experience Enabler	Classification	Indication	Viewing Archetype Presence
Watching to the end	Behavioural, Environmental & Technical	Content watched to the end credits	Quality Time Sharing Space Not Content Opportunist Planning* Self Indulgence.

Table 6.31. Summary of "Watching to the end" enabler.

Giving visual content full attention.

In a number of sessions it was clear that particular content had been reserved for enjoyment on the big screen for users to give their full attention to. During these sessions users avoided parallel activities and large amounts of conversation. Every one of the ten examples of this type of viewing was positively rated with a majority enjoying highly visual documentary content. This categorisation is summarised in Table 6.32.

These sessions took place both in Quality Time and Self Indulgence Archetype situations on the main TV in the living and on large computer monitors.

Viewing episodes were signified by full user attention. Frequency of ME6 code - *video is the only media and video consumption the only user activity*, was significantly higher in positively rated compared to negatively rated sessions (see Figure 6.9). Full screen viewing was also fully utilised with the frequency of DA8 code – *user is watching video full screen*, being significantly higher in positively rated compared to negatively rated sessions (see Figure 6.2).

The shared viewing sessions that are represented in this section followed Taylor and Harper's (2003) description of later evening engaged viewing. In more recent literature Bernhaupt, Pirker, Weiss, Wilfinger and Tscheligi (2011) confirm that the family TV remains the first choice for sharing experiences and offers the best video quality. Bernhaupt et al. (2011, p. 21) also saw a split in user views in relation to if shared viewing in front of the TV offered an opportunity to talk, with 29 users agreeing and 34 disagreeing. This again suggests two types of evening viewing as introduced earlier in the discussion around social viewing and content focused viewing.

Experience Enabler	Classification	Indication	Viewing Archetype Presence
Giving visual content full attention	Behavioural.	Session watched continuously in ME6 – Video content only media and video consumption the only activity	Quality Time Self Indulgence.
		Session watched continuously in DA8 – Video watched in full screen	

Table 6.32. Summary of "Giving visual content full attention" enabler.

User actions as evidence of intent.

Although not directly measured through observational codes, a number of other factors were identified from within the qualitative analysis of the video content as indicative of positive experience (see Table 6.33). Rather than distinct influencing factors these were specific user behaviours that consistently manifest within particular types of experience.

User Action	Hypothesized Significance	Existing evidence in the literature	Related factor / Viewing Archetype
Lowering the light levels	User attempts of create immersive and cinema-like environment.	No examples found.	Giving visual content full attention
Using Headphones	User attempts to block out distraction and focus on the content.	O'Hara et al. (2007). Headphones used to disengage from others and control distraction in the acoustic environment.	(Abating) Distraction and interruption
Downloading content	User roughly pre-plans a viewing experience and downloads content in preparation.	O'Hara et al. (2007). Downloading in preparation for a known upcoming opportunity of use.	Planned Opportunism.
Taking an interval	User takes a rest break during viewing and pauses the content.	Gauntlett and Hill (1999). Describes users wondering around with the TV on. If the user pauses content this suggests some additional level of investment with the content.	Quality Time
Selecting HD content.	User attempts of create immersive and cinema-like environment.	Reeves et al. (1993). HDTV resulted in more favourable user evaluations than SDTV.	Giving visual content full attention

Table 6.33. Summary of user actions associated to positive experiences.

6.5.3 Key Episodes of Experience.

The fact that both positively and negatively rated sessions occurred in every Archetype (see Figure 6.1) suggests that whilst viewing within specific situations offer some affordances in the creation of experience, Archetypes describe contexts of use rather than dictate session outcomes. During the coding analysis a number of consistent patterns emerged in which both positive and negative user ratings within particular Archetypes could be associated to the presence of a group of contributing factors (described individually in the sections above in 6.5.1 and 6.5.2). It's important to stress that the study does not claim to confirm that the factors described are direct drivers in positive or negative experiences, but only that there was a significant difference in the presence of a number of the factors between positive and negatively rated sessions. As such the presence of those factors were indicative of particular *Experience Episodes*. As example the Quality Time Archetype included positively rated sessions based on conversation around content (II3 codes) but also provided positive sessions based on focused engagement with the content and a total lack of conversation (II0 and ME6 codes). Therefore two separate experiential episodes are played out in the same Viewing Archetype but with different indicative experiential factors present.

The range of Experience Episodes observed within the study is summarised in Table 6.34. This presents the factors present, the Archetypes in which they manifest, and the rating outcome. For more detailed descriptions of each Experience Episode see Appendix N Section 10.14.

Experience Episode	Enabling / Detracting Factors	Viewing Archetypes	Rating
Focused Viewing	• No Verbalisation • Watched to end • Giving visual content full attention • Lowering light levels • Selecting HD content • Taking intervals	Quality Time Self Indulgence.	Positive
Social Viewing	• Comment around content • Watched to end	Quality Time Sharing Space but not content.	Positive
Solitary Viewing	• No Verbalisation • Interruption and distraction • Using headphones • Pre-downloading content	Opportunist planning Sharing Space but not content.	Positive
Dissolving value 1 (Delays in reaching video)	• No Video • Dealing with errors • Delays in setting up • Sessions ended early	Quality Time Self Indulgence. Sharing Space but not content. Opportunist planning	Negative
Dissolving value 2 (interruption and distraction)	• Interruption and distraction • Sessions ended early	Quality Time Self Indulgence. Sharing Space but not content. Opportunist planning	Negative
Video as background 1 (off computer)	• Unrelated parallel tasks 1. (off computer) • Sessions ended early	Self Indulgence. Sharing Space but not content.	Negative
Video as background 2 (on computer)	• Unrelated parallel tasks 2. (on computer) • Sessions ended early	Self Indulgence. Sharing Space but not content.	Negative

Table 6.34. Summary of key Experience Episodes.

6.6 Conclusions

The study aimed to answer some key questions around identifying factors indicative of types of viewing experience. Particularly those behavioural, social and technological factors within Viewing Archetypes that could explain the positive and negative ratings viewing sessions received in relation to Satisfaction and UES.

A video coding exercise was used to understand influencing factors and significant differences were seen between positively and negatively rated sessions across a number of the observation codes addressing the aspects of device activity, media engagement, inter-personal interactions and personal context. A secondary analysis also considered content selection choices. These activities have led to the identification of a range of viewing experience enabling and detracting factors, which by their presence within viewing sessions are indicative of positive or negative outcomes. Additionally the grouping of these factors within sessions has been identified as contributing to particular types of experience that play out within specific Viewing Archetypes (Experience Episodes). These also can be related to positive and negatively rated session outcomes.

Limitations of this study were that due to allowing users total freedom in the viewing sessions they captured, coded examples of some system elements and user behaviours were too few in number to allow statistical analysis. This was particularly true in terms of media engagement behaviours, types of interpersonal interaction, and more generally the total number of sessions that were watched to the end titles but rated negatively by users. It is conjecture as to whether examples of the behaviours and outcomes mentioned are missing from the sample due to the study design or merely because those elements are not manifest in the positive and negative viewing scenarios selected for analysis in the study. Larger sample sizes and more directive instructions regarding specific scenarios of viewing to capture may allow a more rigorous analysis of these elements in the future.

The findings from this study represent an important step forward in the main research aims. The results from this study in combination with results from Study 1 (which addressed viewing context), provides a user centred basis upon which a contextualised framework model to describe viewing experience can be built.

7 A Framework for contextualised video consumption

7.1 Introduction

In order to enhance viewing experiences by making an application able to adapt to the context, future technical systems will need to understand and act on the contextual factors related to video consumption. As shown in the literature (see Chapter 2) many attempts have been made to provide solutions to aspects of viewing experience based on an understanding of context. This includes examples such as attempts to contextualise content recommendations (Adomavicius et al., 2005), contextual adaptation of video stream quality (Nepal & Srinivasan, 2003) and more recently, efforts to contextualise video consumption user interfaces (Jung, Hamisu, Duarte, Biswas, & Almeida, 2012).

At the heart of any contextually sensitive system is a model for how that system perceives and reacts to aspects within the situation. The author defines a model in this context as a representation that explains the operation of the contextual adaption system. Therefore underpinning any model is a conceptual framework providing a set of structurally related elements that identify and describe characteristics of situation and their relationships to aspects of user behaviour, the environment and system function. The author defines a framework in this context as a description of the relationships between aspects of context and the user's experience based on consideration of existing research and the concepts generated within this work.

The focus of this chapter was therefore to extend the utility of the research generated in the studies thus far by relating the concepts within a logical framework structure linking lower-level components of context to the identification of viewing situations and specific Experience Episode. The goal in creating a framework is to inform future context system designers in approaches to better identify and then optimise support for specific types of viewing user experiences created within different contexts.

Creation of conceptual frameworks to support models of context is not novel. However the author believes a weakness exists in the models currently implemented within contextualised systems related to video consumption, in that the frameworks on which they are based do not adequately consider the reality of viewing context from the user's perspective. Most examples in the literature suffer from taking one of three general design approaches. These are summarises in Table 7.1 below but previously discussed in more depth in the related work explored in Chapter 2 Section 2.4.

Approach	Description	Examples	Limitations
Generic	Develops generic algorithms to solve context adaption. Applied to any task and any context. Represents context as constraints on the reasoning algorithm.	Karatzoglou et al. (2010). Baltrunas et al. (2011a)	No consideration given to identifying contextual factors. No consideration of the real world inter-relationships between contextual factors and the user.
Reductionist	Starts with widest range of contextual factors. Identifies influencing factors from the initial range over time by calculating correlations within the model as the user builds up their profile and provides feedback.	Vargas-Govea et al. (2011). Adomavicius et al. (2005).	Scaling issues and heavy data processing. Possibility of missing out important factors from initial list. Data sparsity issue as difficult to capture enough data against every factor.
Technologist focus	Contextual factors and relationships are pre-defined based on developer opinion, or derived from inappropriate user elicitation methods for contextual investigation, (such as out of context interview or questionnaires).	Silva et al. (2012). Baltrunas et al. (2012). De Pessemier et al. (2008).	Inadequately consider contextual factors. Possibility of missing out important factors. Inadequately consider the real world inter-relationships between contextual factors and the user.

Table 7.1. Summary of the current approaches to modelling context adaption.

Whilst (as described in Table 7.1) many novel approaches exist to consideration of context in adaptive system models, there is currently little focus given to the reality of the situations of use or the user's perception of context. The fundamental components of framework the research needs to inform from the basis of providing a user centred focus are:

- How the system defines the current viewing context.
- The experiential factors the system defines as contributing to experience within those contexts.
- What experience outcome the system predicts based on the factors present.

On this basis, designers can create design solutions that can adapt to the experience at hand, taking steps to support different types of experiential episodes. This will involve ameliorating the presence of negative experiential factors and promoting experiential factors that lead to positive outcomes. Such adaptation could come in many forms, from promotion of specific content, manipulation of content length or format, presentation of additional supporting applications, or changes to the user interface.

The framework therefore has applicability to a wide range of areas where contextual adaption in relation to video offers possible advantages. This includes improving implicit feedback mechanisms within content recommenders, user interface adaption, hardware device design, second screen application developments, primary video consumption applications and personalised advertising.

Within this research the goal of the generation of a conceptual framework for contextualised viewing is to inform future technical models for viewing context.

In addition an outline model that includes information based on real world understanding of viewing situations and user experiences will also be created.

The hope in taking this second action is to inspire technical architects to create better-informed system models for viewing experience adaption. This approach would represent an example of the augmentation of an adaptive system through a rule-based framework (see Nguyen, Denos and Barrut, 2007). Finally some example scenarios will be offered to serve as both design references and system architecture guides for designers and developers considering viewing experience within new video services.

7.2 Defining viewing context

As noted in the introduction to the chapter, a key weakness with existing frameworks from the literature are the various approaches to the selection of contextual information to include in system design. The result of this is a general lack of solutions that formulate a model for viewing context based on real world insights of viewing experience. In contrast, the approach taken in this research has attempted to collect and classify viewing context information wholly in terms of user's internalised models of Situatedness (as defined by Rohlfing et al. 2003).

The approach represents an alternative method to contextual information interpretation, and permits the world to be shrunk to only those key scenarios of use (Viewing Archetypes) that usefully represent the vast majority of perceived video consumption contexts. Additionally this approach offers the prospect of simpler technical system design, as a reduced level of contextual information is needed if the goal is only to identify those key scenarios rather than make sense of the entire physical, social and technical environment.

To identify the Viewing Archetype, higher-level aspects of context must be derived. In turn, identifying the presence and status of those artefacts must by possible from lower level context information available to the technical system as inputs. Therefore identifying viewing context can be described through a simple framework approach (Figure 7.1).

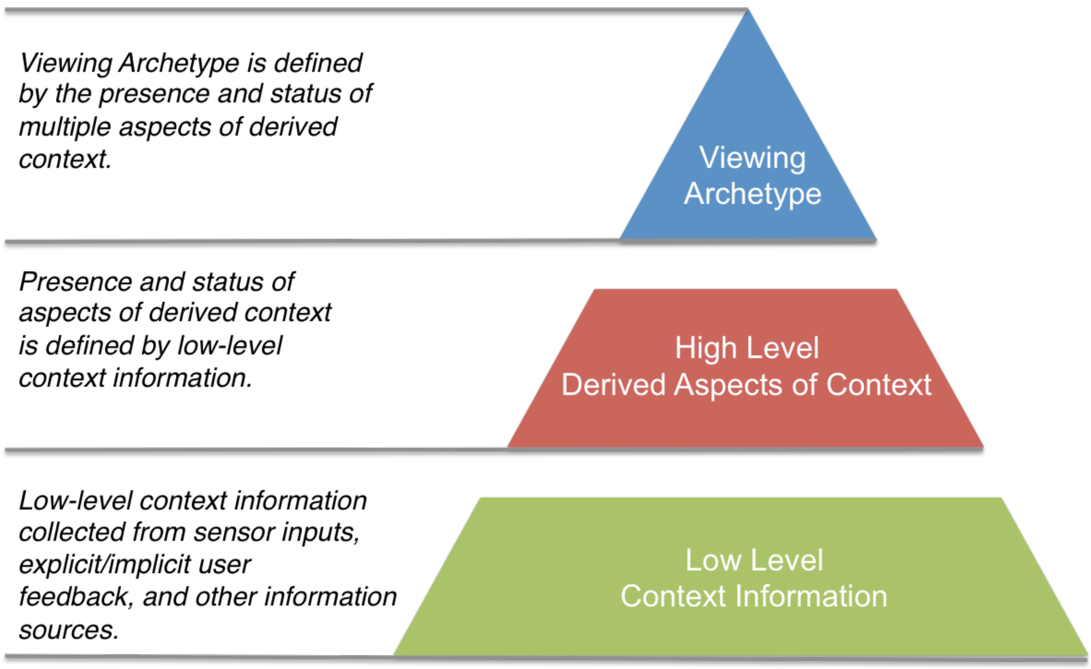


Figure 7.1. Simple framework for defining viewing context.

Within study one (chapter 4), four key Viewing Archetypes were documented. Through observation and diary insights the underlying contextual cues identifying those Archetypes were defined. That information will be refined into constructs which align to the simple framework for viewing context noted in Figure 7.1. The aim in doing so is to define the context information and data relationships a future system would need to model in order to discriminate one Viewing Archetype from another.

In study one, three key aspects of contextual information were identified as key to creating viewing context, these were:

- Location
- Socialness
- Temporal Factors.

As each aspect contributes to the creation of multiple Viewing Archetypes, the approach taken to defining the framework has centred on formalising these factors, (and how they differ by Archetype). Discussion in the rest of this section addresses each of the aspects in turn.

7.2.1 Locational Aspects.

The division of viewing at home compared to out in public.

Throughout the research the division of viewing situations occurring either within a public space or a private home has appeared a key factor in understanding the levels of engagement and attention given to video content. In the vast majority of cases the highest levels of engagement with content occur in the privacy of the home. Identifying this key contextual cue could allow a clear and useful division in the contexts in which viewing occurs for a future system to exploit.

During the investigations into viewing context in Study 1, viewing experiences captured in private locations were shown to be very different from those captured in public (Chapter 4, Section 4.4.3). This finding supported the general views in the literature that watching in private situations (such as in the home) promotes a different type of viewing experience compared to contexts out in public (Tamminen et al., 2004). Study 2, part 2 (Chapter 6, Section 6.4.3), highlighted clear differences in the highest levels of observed media engagement attained when viewing at home, compared to viewing out in public. Additionally in Study 2, part 1, viewing experiences captured at home in Quality Time and Self Indulgence Archetypes consistently attracted the highest levels of user reported Satisfaction and UES across the whole study (Chapter Five, Section 5.4.4).

There are many possible reasons contributing to the differences in reported responses between viewing at home and viewing out in public:

- Users in the home have access to, (and utilise) all of their video capable devices, allowing the widest access to content and best affordance and freedom in terms of creating enjoyable experiences. Bernhaupt et al. (2008) also notes users have strong positive perceptions towards technology that support feelings of being at home and respect people's privacy.

- Viewing outside of the home in the Opportunist Planning Archetype is undoubtedly compromised in comparison. Once users leave the home, choices around consumption device and content diminish. This puts extra emphasis on the user to pre plan, store content on their devices and consider connectivity in order to facilitate positive viewing experiences.

- In the Opportunist Planning Archetype many of the environmental factors that can affect our ability to focus on content come into play. The many distractions when out in public can lower user attention. There is also the fact that in busy public environments users wish to retain situational awareness and simply do not wish to switch off their attention from the world around them and give it over to watching video. These factors interrupt viewing and impact engagement. Key distractors observed include parallel tasks (which were the norm when outside the home), as well as the hustle and bustle of busy visual and auditory environments.

Despite the noted issues, some users were still able to create enjoyable viewing experiences outside the home (see Chapter Six, Section 6.4.2). However it's important to concede that many viewing experiences in this context are very different from those created at home, and supporting those UXs are clearly different tasks for any future technical system.

Formalising the contextual cues of location

Not every viewing situation captured outside the home during the studies fell neatly into the Opportunist Planning Archetype. The consistent contextual cue for the Archetypes of Quality Time, Self Indulgence and Shared Space But Not Content was actually that viewing occurred in private, rather than in the home.

Although in practice most private viewing did indeed occur in the home, numerous examples from across the studies (although small in number) showed viewing away from the home that did not conform to the Opportunist Planning Archetype. These included examples from Study 1 of Quality Time Archetype situations being generated in the homes of friends (see Chapter 4, Figure 4.7), and Self Indulgence Archetype viewing being created in semi private areas such as open plan offices when no one else was around (see Chapter 4, Figure 4.4). This highlights an issue in simply reducing the complexity of the wider contextual notion of public and private viewing to only home or away information. Therefore within the conceptual framework privacy needs to be considered as a contextual parameter.

Privacy is an expansive area of research, and the characterisation of privacy is complicated further by the lack of an agreed definition (Newell, 1995). Seminal definitions from the literature include Weston (1967) who defined privacy as the control of how information about a person is held and communicated to, and Altman's (1976) definition of privacy, including the physical aspects of limiting social interaction and the ability to control personal space and territory. Altman's (1975) related concept of privacy as a mediated and dynamic boundary fits well with the complex interplay seen in Study 1 of how privacy is identified within viewing contexts by users (see Chapter 4, Section 4.5.1). A further relevant definition is offered by Bellotti and Sellen (1993) in relation to technology. This states that privacy management requires control over both information itself and to whom and when it is conveyed.

Bellotti's at al. definition could be usefully related to physical spaces. However in the context of entertainment technologies as under consideration here the author agrees with Palen and Dourish (2003) that privacy management concerns centre around interpersonal matters, the minimisation of embarrassment, and the perceived control of a public facing identity rather than control of critical personal information. At home users can feel in control of the physical environment and confident about what interpersonal information is being elicited, and with whom shared. Typically this is trusted friends and family members with whom the user has existing affiliations and allegiances (Palen & Dourish, 2003). This perception is retained even if people within the environment do not directly share the experience (such as in the Sharing Space But Not Content Archetype). Away from home the user loses control over the environment. The risks of the viewing experience being observed by others who are not trusted individuals therefore increase. As such, control is also reduced over what interpersonal information is shared and with whom. This affects users in different ways, but can impact factors such as content choice and user's naturalistic viewing behaviours. Strohmeier et al. (2008) reported for example that users were concerned about watching horror content in public as they couldn't control co-viewers. Strohmeier et al. identified user concerns about losing awareness of who was observing them when watching in public, which in turn inhibited users from becoming too engrossed in content.

Whilst in Opportunist Planning Archetype sessions the possibility of being observed is the norm, however as previously noted there are occasions outside the home when perceptions of privacy can be maintained. Within these contexts, whether through the perceived lack of other people who could observe the user or because of the existing alliances and allegiances between the user and other actors, users appear confident they are able to manage privacy. Building upon Rohlfing et al's. (2003) concept of "*situations in which actions take place"* these viewing sessions can be considered as occurring in transitional spaces (see Figure 7.2). Depending upon user perceptions of privacy control these locations can flip in the minds of viewers between being considered private or public spaces.

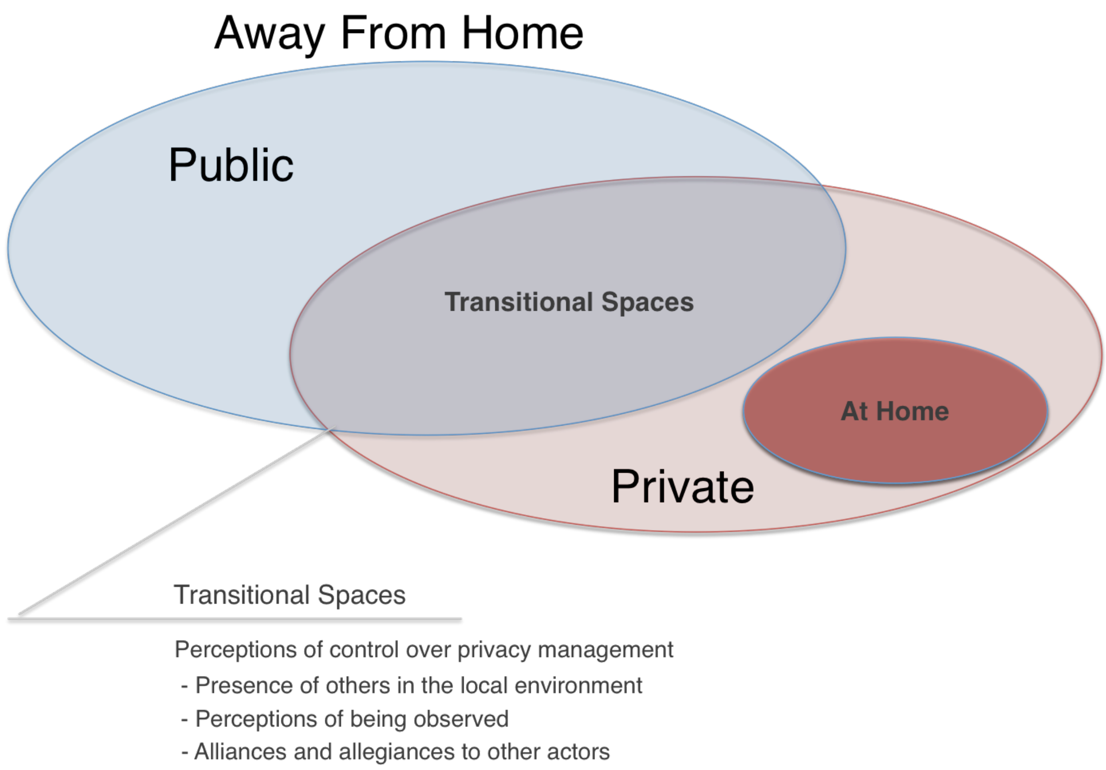


Figure 7.2. The division between private and public viewing, including the concept of transitional spaces.

Framework considerations for location.

Whilst the concept of a user's perceptions of control over privacy management offers a model for why viewing at home is consistently considered private, it introduces additional complexity in defining viewing outside the home as either public Opportunist Planning or alternatively one of the private Viewing Archetypes. To correctly classify such viewing sessions a system may need to intelligently consider the significance of some locations outside the home, the presence of other actors in that local environment and even possibly their social relationships in order to define the demarcation between Archetypes.

As Figure 7.3 layouts out, we can therefore consider two derived locational contexts that can usefully map to Viewing Archetypes. Whilst within a technical model inference is needed from low-level context information sources and sensors, ultimately the derived locational context information of importance is whether the viewing occurs in private or public.

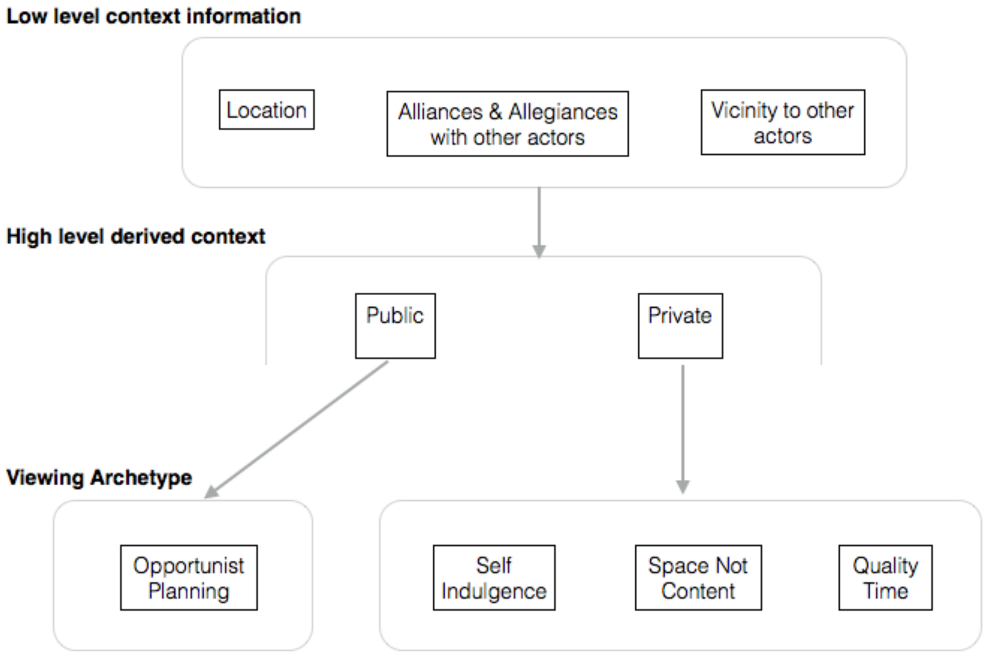


Figure 7.3. Classification of locational context information. Derived context from low-level context information, and relationships to Viewing Archetype.

Although representing transitional spaces presents both a contextual edge case and a challenging viewing situation for any future system to identify, it is important viewing that occurs in these scenarios outside the home can be identified. Opportunist Planning presents such diverse challenges in terms of facilitating positive outcomes when compared to private viewing that different design adaption approaches will be needed to support each successfully.

7.2.2 Socialness.

Viewing alone or in the presence of others.

In Study 1 the levels of social interaction between actors in the vicinity of viewing was a key contextual cue to defining viewing situation (see Chapter 4, Section 4.4.3). In Study 2, part 2 the presence, nature and levels of social interaction between other actors and the user were key experiential factors with influences on both satisfaction and UES (see Chapter 6, Section 6.4.4). The lack of socialness within solitary private viewing was also shown to create very different experiences from those where content or space is shared. Viewing alone has specific traits:

- Users can choose their own content at will.
- Users who incur technical or usability difficulties when viewing alone find these more problematic to solve on their own compared to when viewing with others.
- Short-term erosion of the experience by usability problems, technical issues or interruption meant users are much more likely to wind up viewing early compared to when viewing was shared (see Chapter 6 Section 6.4.4).

The privacy management issues noted in the last section are keenly felt when viewing in public, and more generally viewers watching in the Opportunist Planning Archetype must cope with additional constraints and distractions. However in terms of some social aspects, public viewing shares many of the attributes of solitary private viewing. Users still make personal choices in content, have to deal with usability or technical problems alone, and take independent decisions over winding up the experience.

Shared private viewing creates very different experiences, with the possibility for large amounts of social interaction. Users sharing viewing spent more time deciding what to watch, even planning to sit down for specific “event” shows (this was common in the Quality Time Archetype, see Chapter 4, Section 4.4.3). Users were also less likely to switch off when viewing was shared compared to when viewing alone. Critically, Study 2, part 2 also described two modes of shared private viewing, focused and social (see Chapter 6, Section 6.5.3). Although all Quality Time sessions were social, levels of interaction varied significantly. Lampooning, comment or critique of content provided an additional positive social dimension to the overall experience (see Chapter 6 Section 6.4.4). Despite both viewing experiences occurring in the Quality Time Archetype these modes of consumption were quite different from one another and therefore were separately identified within the definition of key Experience Episodes.

Sharing Space But Not Content Archetypes offer a mixture of social elements from both shared and solitary viewing. Whilst the viewing itself is experienced individually, the presence of others can help in problem solving usability or technical issues, (as already mentioned above). Once the viewing experience is underway further social interaction as well as the physical interruption of other's not involved in the experience was generally unwelcomed. For example, off topic conversation observed in this Archetype was perceived by users as disruptive (see Chapter 6, Section 6.4.4). The best Sharing Space But Not Content experiences therefore consisted of users in close proximity but using headphones on personal devices in order to remain focus on their own content, minimising on-going social interaction and physical distraction.

Supporting solitary, co-located and shared viewing experiences with differing levels of socialness are clearly different tasks. Understanding if an experience is shared and also the levels of socialness within that experience has implications for designing how content is discovered, errors are problem solved, and the appropriate level of social interaction which should be fostered as a feature of the experience. Therefore it's important any future technical system can consider socialness when characterising Viewing Archetypes.

Formalising the contextual cues of socialness.

Clearly the concept of solitary or co-located viewing neatly defines a separation between individualised experiences such as Self-Indulgence from more social situations such as Quality Time and Sharing Space But Not Content. However understanding if a co-located experience is actually shared is a difficult concept to confirm. As example, Study 2, part 2 showed that users Sharing Space But Not Content often drifted in and out of actually sharing the content based on conversation, (see Chapter 6 Section 6.4.4).

Whilst the consistent co-located presence of two or more people is feasible to consider as a pre-cursor for shared experience, it is unlikely that any future system could differentiate between a truly shared or simply co-located situation through presence information alone. Opportunist Planning as example, though solitary can be conducted in close proximity to other people. A more advantageous ways of discerning if two or more actors in the environment are sharing the experience maybe through a simplified approach based on the frequency people watched in the different Archetypes during the study (see Chapter 5, Figure 5.7). Therefore in the absence of other factors (that may suggest the situation is something different), public co-located viewing can be initially predefined as solitary (Opportunist Planning), and private co-located viewing initially predefined as shared (Quality Time).

The remaining question is which feature of derived context provides those additional factors that then differentiates truly shared private viewing (Quality Time) from Sharing Space But Not Content? A number of sources of low-level contextual information could possibly provide the required insight:

- If co-located users are both using separate devices then this is a strong indicator of parallel activities. However due to the growing behaviour of second screening, this factor alone is not conclusive.

- The additional use of headphones by at least one of the users provides more conclusive evidence that the experience is not being shared.

- A third indicator not related to device use would be the other actors in the situation conducting unrelated parallel tasks, (such as tidying up, cooking, etc.) in which their focus was not on the screen.

As depicted in Figure 7.4, this process of deduction using appropriate cues quickly identifies the likely key differentiating Experience Episodes and Viewing Archetypes that can arise within co-located private viewing.

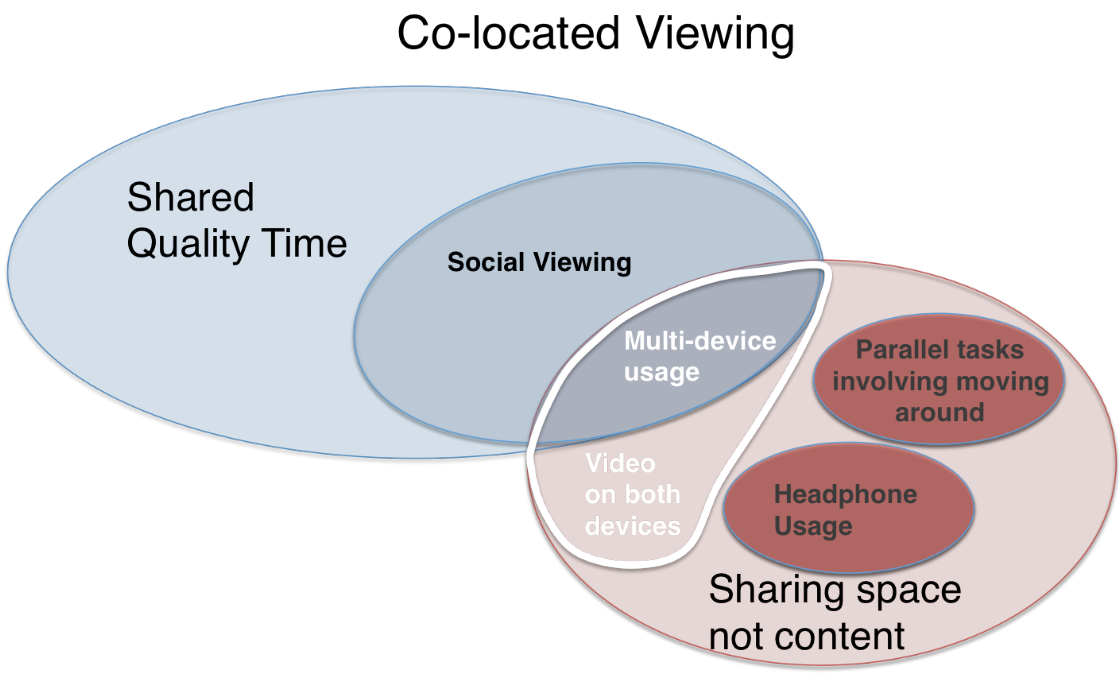


Figure 7.4. The use of device related cues to define the division between Shared Quality Time and Sharing Space but not Content viewing when co-located private viewing occurs.

Considerations of how socialness can usefully map within the framework to Archetypes is shown in Figure 7.5. As earlier discussed the issue of identifying differences between shared experiences is key to deriving context in co-located viewing scenarios.

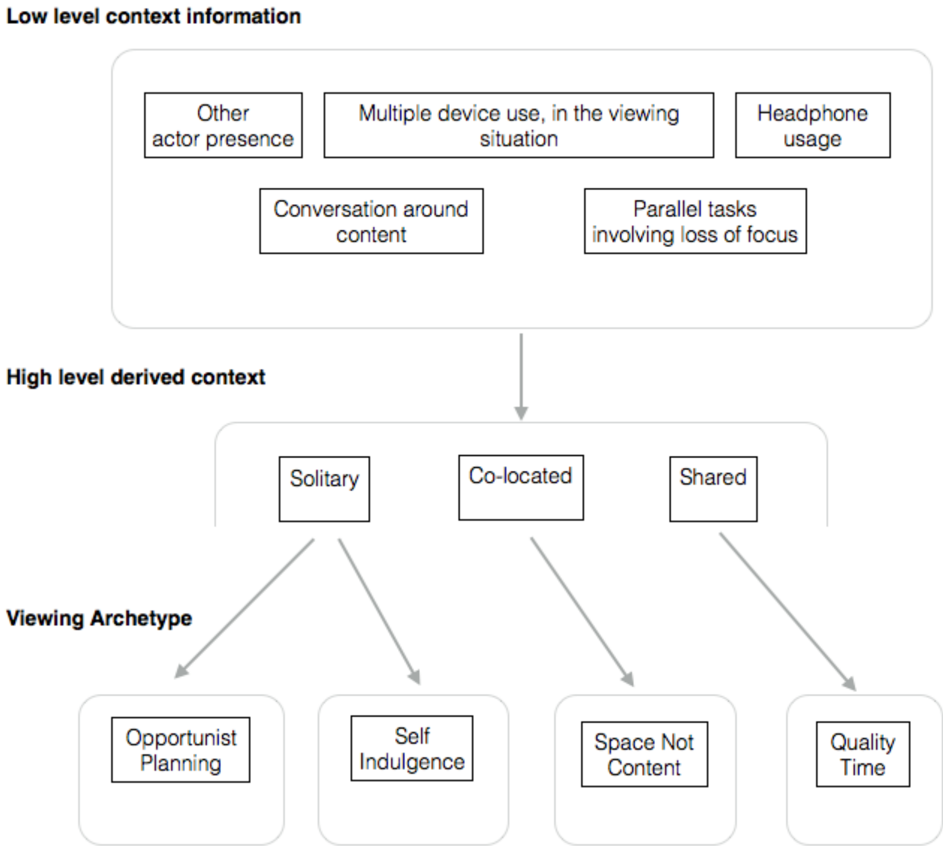


Figure 7.5. Classification of socialness context information. Derived context from low level context information, and relationships to Viewing Archetype.

7.2.3 Temporal factors.

When do you watch?

The final key factor in identifying the current viewing context was the temporal situation. Time of day and daily come home patterns of behaviour were key to identifying the transition from Family Viewing to Quality Time Archetypes. A system that can learn these patterns and identify the transition in temporal context from one to the other is feasible from established research. For an example see Kappel, Proll, Rotschitzegger, Schwinger & Hofer (2001).

Study 1 verified many temporal patterns, including that some described within the literature still exist. The most notable of these were:

- Weekday evenings followed a “come home” behavioural routine as originally defined by Taylor and Harper (2003). This influences social interplay between household members and viewing consumption patterns.

- Viewing patterns in the home are different at the weekend from in the week (Study 1 diary finding).

- Viewing in public contexts is often highly constrained by temporal factors outside the control of the user Tamminen et al. (2004).

Study 2, part 2 provided additional information in relation to the levels of attention given to content at different times in private viewing situations (Chapter 6, Section 6.4.3). Of particular relevance was that the weekday come home evening routine consistently included a transition from less engaged background viewing (often including parallel tasks) into the various forms of Quality Time viewing in the evening. Generally in most households this process was a gradual shift firstly into Social Viewing and then Focused Viewing later on, (however due to watching VoD this transition was not always clear cut). Quality Time sessions occurred after 7pm in most homes, however exactly when this transition occurs depends upon the individual routines of that household and the family members present.

Both Study 2, part 2 (Chapter 6, Section 6.4.3), and the diary data from Study 1 (Appendix F, Section 10.6) identified differences in temporal patterns of viewing behaviour at the weekend versus the week. This was manifest in two distinct behaviours. Firstly, (and due mainly to being at home) more viewing occurred in the day over the weekend. This included both social Quality Time experiences such as watching sport and many more examples of individual Self Indulgence Viewing. A further significant point to note in relation to weekend viewing was although the transition into Quality Time still occurred in the evening, it was possible for that transition to happen at an earlier time in the same household compared to during the week, (with the sports example noted above being a case in turn). Other examples included households all sitting down together to watch movies, big dramas and showcase wildlife documentaries.

Calendar date also represents another clear way to define actions with temporal meaning. Understanding (and differentiating) weekends and public holiday viewing from working weekdays is important due to the differences this factor has in people's daily routines.

Referencing the time of day is key to characterising the switch into evening Quality Time viewing (both in the week and at the weekend, assuming this can happen at different times). This together with other derived context information offered by socialness, (as discussed earlier in this chapter) could provide a significant indicator that the household is transitioning into Quality Time viewing.

Finally learning the duration of sessions within given viewing situations would also provide a powerful contextual cue. Even if for example Opportunist Planning viewing is temporally constrained, if that constraint is consistent, (e.g. a daily train commute or a lunch hour) then a system that learns the duration of that viewing window could provide useful contextual suggestions for content. Equally, understanding the duration and nature of sessions more generally across the day also provides the opportunity for better tailored content and adaptation. As example if a family's daily evening viewing consistently starts with a catch up on the day's news then a system could learnt that behaviour and provide support for that regular event.

Clearly the cues related to temporal information incorporate a blend of both rules and a reliance on learnt patterns of usage. Therefore the framework needs to support the gathering of relevant low-level context information rather than use temporal context to explicitly identify Archetypes.

Figure 7.6 defines the organisation of temporal information within the context framework. Weekend and weekday viewing is treated separately. The evening viewing routines (separated into temporal phases) is considered distinct from viewing in the day.

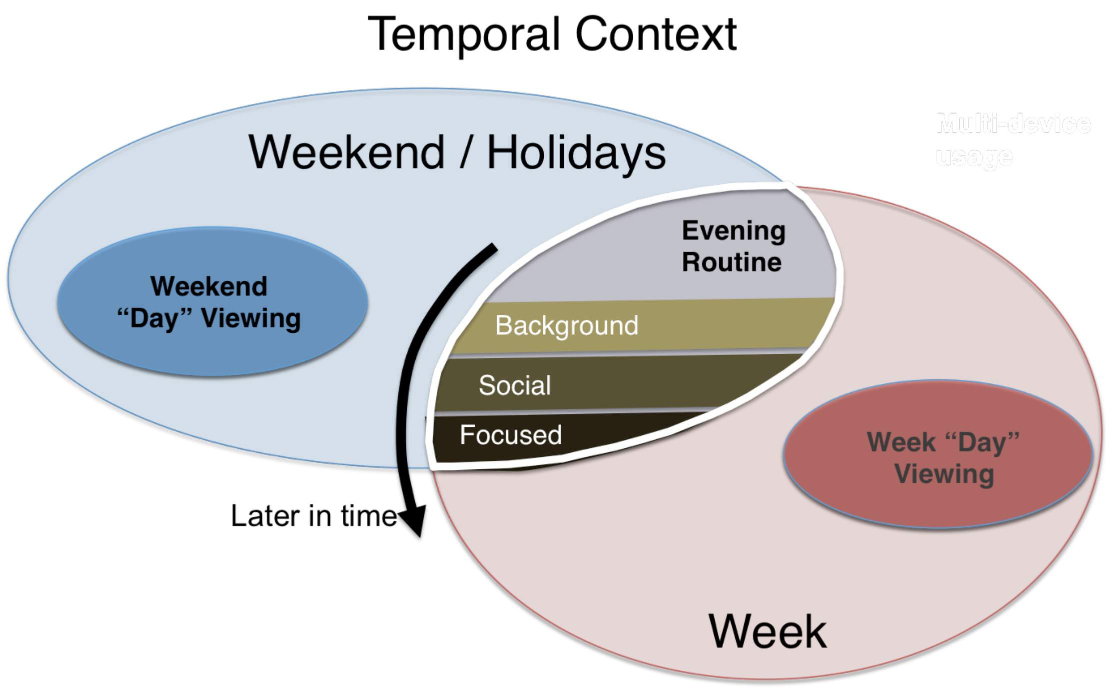


Figure 7.6. Temporal divisions are proposed across weekdays and the weekend as well as daytime viewing and evening routines.

How low-level temporal context information could usefully map to derived temporal context is set out in within Figure 7.7. As earlier discussed such a framework would sit outside of explicitly defining Viewing Archetypes. However by collecting temporal information in parallel to other contextual information within a system model, temporal information could be used as an overlay to aid identification of the onset of specific Experience Episodes. By learning user behaviour over time, temporal context can additionally inform content suggestions and adaption strategies based on specific timings or regular events.

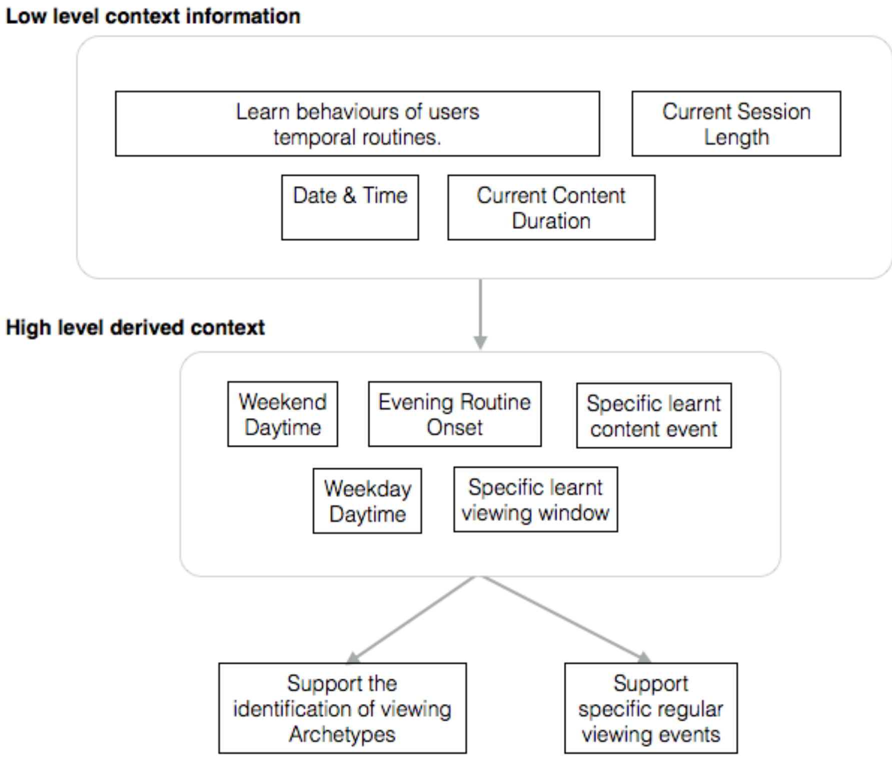


Figure 7.7. Classification of temporal context information. Derived context from low level context information and relationships to useful supporting uses from temporal information.

7.3 Identifying Archetypes

The framework components of context defined in the last section directly map to the identification of Viewing Archetypes. As such the framework relationship between high level situational descriptions of viewing context in the form of Viewing Archetypes and low level context information available to systems through sensors and connected services is explained. In this short section each Archetype is defined in terms to the derived aspects of context from within the framework used to identify it. This is done to make the specific elements of derived context from across the three aspects of context investigated explicit within the framework description.

Each of the four Archetype framework definitions are depicted below; Opportunist Planning (Figure 7.8), Sharing Space But Not Content (Figure 7.9), Self Indulgence (Figure 7.10) and Quality Time (Figure 7.11).

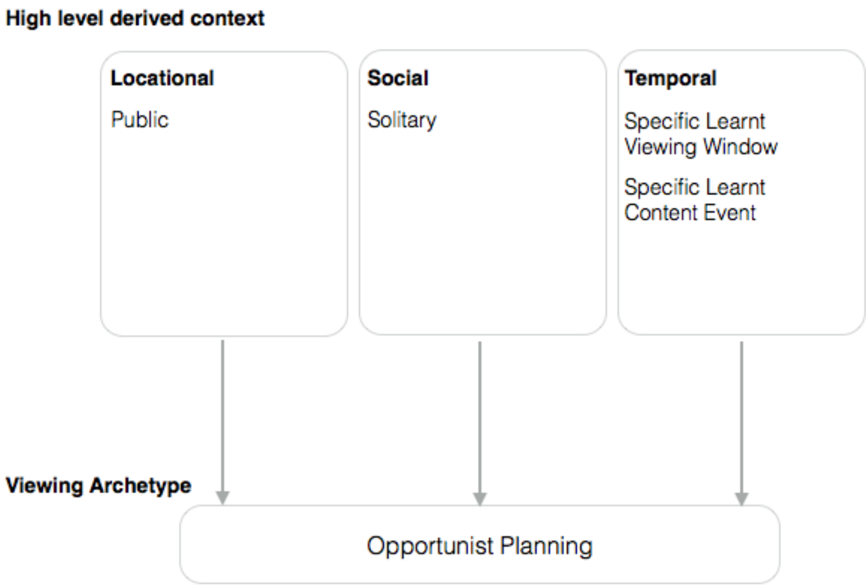


Figure 7.8. Framework description of Opportunist Planning, as defined from aspects of derived context.

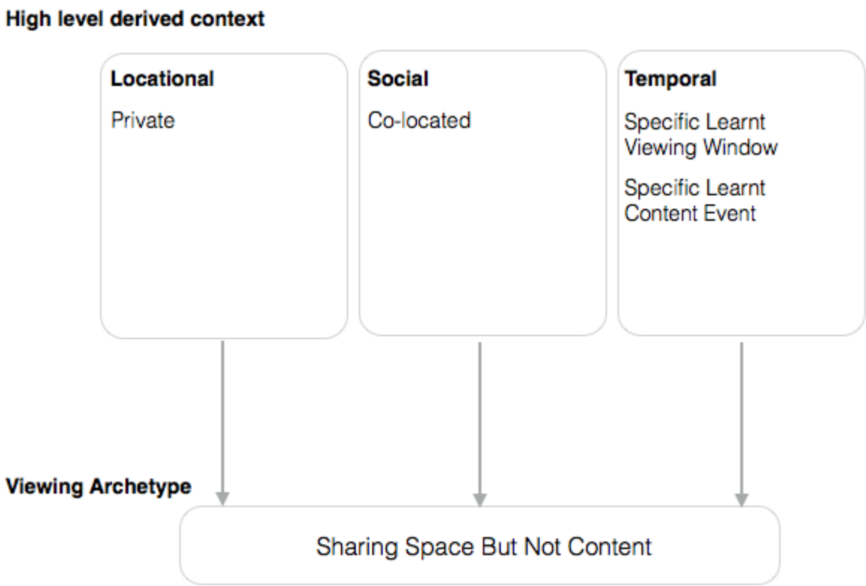


Figure 7.9. Framework description of Sharing Space But Not Content, as defined from aspects of derived context.

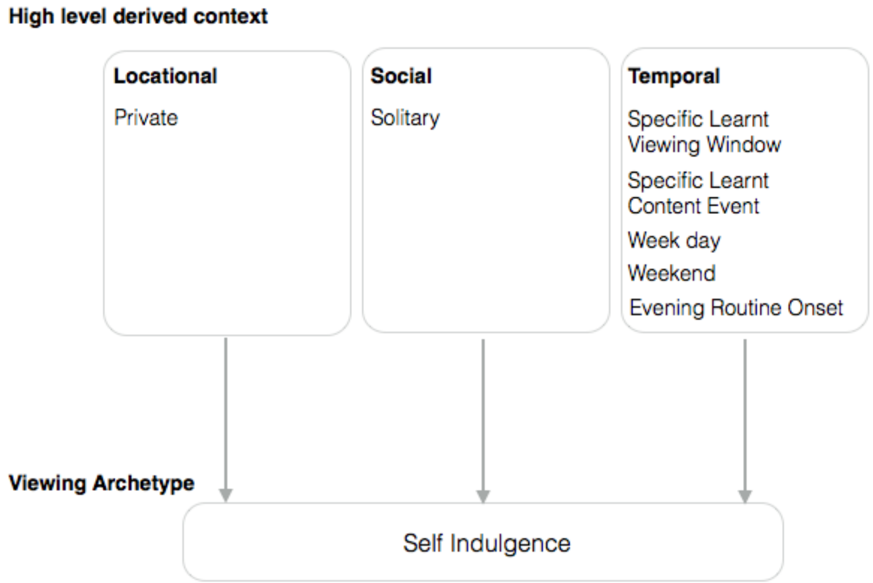


Figure 7.10. Framework description of Self Indulgence, as defined from aspects of derived context.

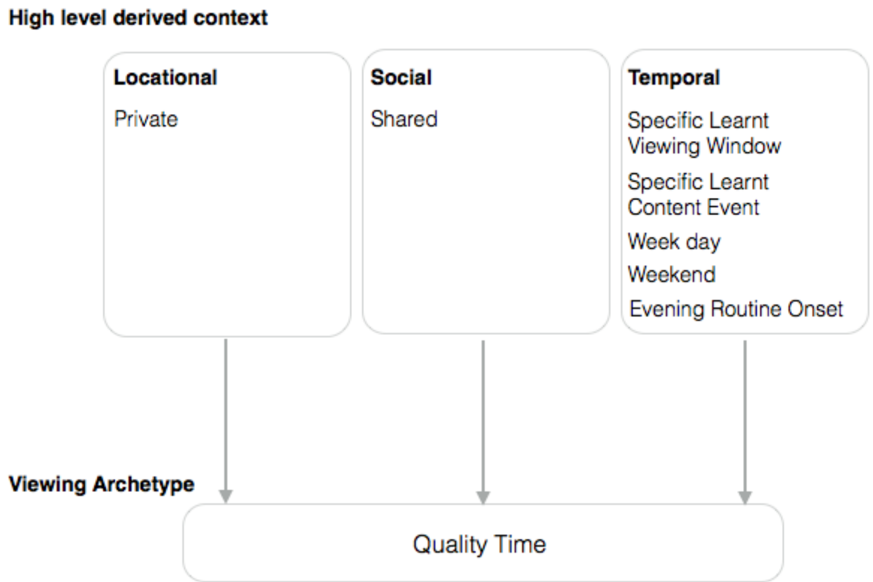


Figure 7.11. Framework description of Quality Time, as defined from aspects of derived context.

7.4 Experiential factors

An adaptive system needs to take transformative action to improve the experience at hand, and therefore beyond understanding the viewing context also needs to make projections on the likely experiential outcome for the viewing session. Whilst user feedback mechanisms are well established (Hu, Koren, & Volinsky, 2008; Zigoris & Zhang, 2006), utilising information from the user session underway as a real time inferential indicator of likely experience is rarely used to inform dynamic adaptation.

Conceptually the approach proposed to address this deficiency is to utilise the experiential enablers and detractors identified in chapter 6. These are summarised below in two tables depicting the detracting factors (*Table 7.2*), and enabling factors (*Table 7.3*). In both cases the factors are presented with evidence of how they influence experience (from Study 2 or the literature) and a suggestion for how a future system might possible infer the existence of the factor within the viewing session. The factors can be used both as an inferential resource through which to predict the experience outcome and as an adaption toolkit which can be used to positively influence viewing. As has been previously discussed in Chapter 6, within each Viewing Archetype the presence of certain experiential detractors and enables were indicative of specific experience outcomes (the Experience Episodes). Thus by detecting the presence of these factors in a session a prediction regarding the likely Experience Episode can be made. If that outcome is not associated to positively perceived experiences then adaptions can be employed aimed at ameliorating the detracting factors present and promoting a different set of enabling factors that are indicative of an alternative (and more positive) experience.

Ultimately these aspects of the framework inform future system designers about which factors an adaptive system should seek to promote or abate within a specific Viewing Archetype in order to provide the best viewing experience.

Experiential Factor	Detractor ID	Opportunities to identify (*Evidence*)
Delays in setting up	Detractor (D1)	Long duration from start of task to initiating video. *(DA2 – user is preparing to watch: Longer individual instance and summed total durations in Study 2, part 2).*
No video	Detractor (D2)	Long total duration over whole session with video not present. *(ME0 – video not present: Longer summed total durations in Study 2, part 2).*
		Total time spent buffering. *(DA4 – Waiting for content: Longer summed total durations in Study 2, part 2).*
Ending sessions early	Detractor (D3)	Video stopped before end (*Session ended before content ended in Study 2, part 2*).
Dealing with errors	Detractor (D4)	High levels of conversation without video playing. (*II7 – user comment, logistical: Increased frequency in Study 2, part 2).*
		Long duration from start of task to initiating video. *(DA2 – user is preparing to watch: Longer individual instance and summed total durations in Study 2, part 2).*
Distraction and interruption	Detractor (D5)	Frequent loss of gaze focus. *(Oscillation between ME5 and ME6 codes throughout the session in Study 2, part 2)*
Unrelated parallel tasks 2. (on computer)	Detractor (D6)	Other applications open on screen. *(Session watched continuously in ME5 - Video is the only media but viewing is a secondary task in Study 2, part 2).*
		Video watched in a window not full screen. *(Session watch continuously in DA7 – user watched in a window in Study 2, part 2).*
Unrelated parallel tasks 1. (off computer)	Detractor (D7)	Frequent loss of gaze focus and movement away from screen whilst video is playing. *(Session watched continuously in ME5 – Video is the only media but viewing is a secondary task in Study 2, part 2).*

Table 7.2. Summary of detracting experiential factors, supporting evidence and suggestions for methods through which to infer presence in a viewing session.

Experiential Factor	Enabler ID	Opportunities to identify (*Evidence*)
Giving content full attention	Enabler (E1)	User maintains gaze focus on screen. *(Session watched continuously in ME6 – Video content only media and video consumption the only activity in Study 2, part 2).*
		Video is watched in full screen. *(Session watched continuously in DA8 – Video watched in full screen in Study 2, part 2).*
Comment around content	Enabler (E2)	High levels of conversation about content. *(II3 User comment – content: Increased frequency in Study 2, part 2).*
Using Headphones	Enabler (E3)	Headphones used whilst video is playing to block out distraction. *(Qualitative observation in Study 2, part 2 and supported by findings in O'Hara et al.* (2007)).
Consuming downloaded content	Enabler (E4)	Consuming downloads suggests content interest as well as planning and investment in the experience. *(Qualitative observation in Study 2, part 2 and supported by findings in O'Hara et al.* (2007)*)*
No verbalisation	Enabler (E5)	Low levels of conversation through the session. *(II0 – No verbalisation: Increased frequency and longer summed total duration Study 2, part 2).*
Selecting HD content.	Enabler (E6)	User selects HD option. *(Qualitative observation in Study 2, part 2 and supported by findings in Reeves et al.* (1993)*)*
Watching to the end	Enabler (E7)	Video watched to start of end credits *(Content watched to the end in Study 2, part 2)*
Lowering the light levels	Enabler (E8)	Lights in the viewing room are switched off / curtains are closed to block out light. *(Qualitative observation in Study 2, part 2).*
Taking an interval	Enabler (E9)	User pauses content and leaves room to fix drink or take rest break before resuming. *(Qualitative observation in Study 2, part 2 and supported by Gauntlett and Hill* (1999)*).*

Table 7.3. Summary of enabling experiential factors, supporting evidence and suggestions for methods through which to infer presence in a viewing session.

As experiential factors had differing influences on experience in different viewing situations it is logical to consider these in relation to each Archetype within the framework.

7.4.1 Framework elements for Opportunist Planning

The viewing experience within Opportunist Planning situations relies on the management of interruption and successful mastery of the technical challenges that watching in public presents. Such experiences were observed to diverge down two scenarios. In positive experiences the user has access to content of interest, found enough opportunity to watch for a meaningful duration, and successfully blocked out interruptions from the environment (usually through the use of headphones). In negative situations the users were dogged by technical difficulties trying to access content or became fazed and disturbed by interruptions from the environment. For both negative outcomes, users regularly wound up viewing earlier than they would have liked. On some occasions this was due directly to interruptions beyond their control. Figure 7.12 defines the relationships within the framework between Opportunist Planning, (Viewing Archetype), influences on experience (experiential factors) and outcome (Experience Episode).

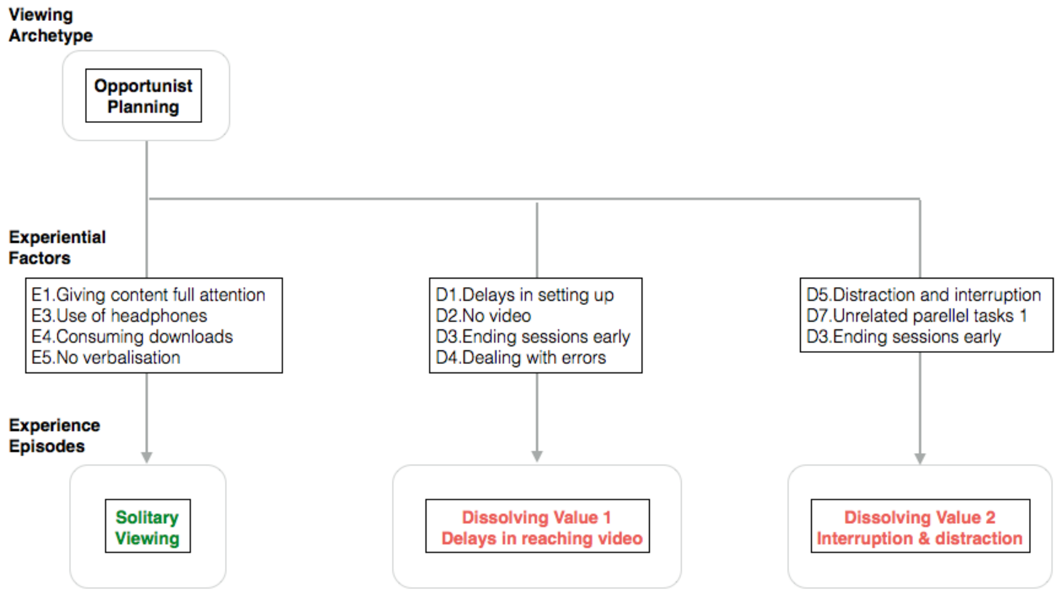


Figure 7.12. Contributing experiential factors that characterise the Experience Episodes created within the Opportunist Planning Archetype.

7.4.2 Framework elements for Quality Time

Quality Time offered users the best opportunities for engaged and rewarding viewing. However the two positive Experience Episodes the viewing context affords (focused and social) are very different, with differing experiential factors present. Negative sessions in the Quality Time Archetype suffer from the hygiene issues of overcoming technical problems. This results in a dissolving of the value of the experience through delays in reaching content. Figure 7.13 defines the relationships within the framework between the Quality Time Archetype, experiential factors and Experience Episodes.

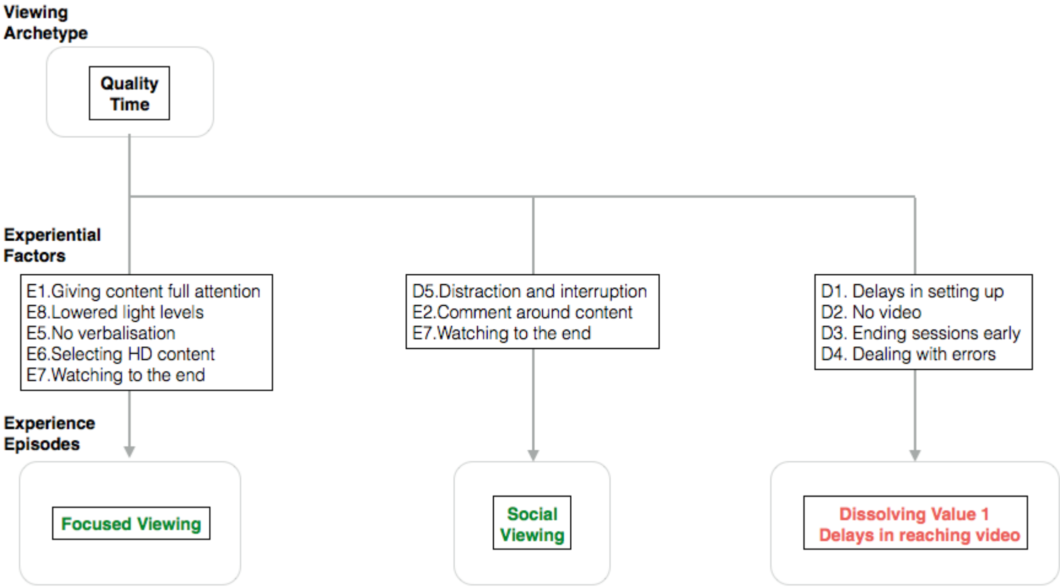


Figure 7.13. Contributing experiential factors that characterise the Experience Episodes created within the Quality Time Archetype.

7.4.3 Framework elements for Self Indulgence

Self-indulgence viewing offered the highest flexibility in where and on which devices experiences were created. However the solitary nature of the viewing limits the Experience Episodes that can be created. Significantly the Self Indulgence Archetype is the context most prone to dissolving value. This was due to the joint factors of the additional difficulties in solving technical issues alone, whilst also having the freedom when watching alone to end the session when you like. Self Indulgence situations were also where the least engaged viewing occurred. Background usage and parallel tasks were common.

Figure 7.14 defines the relationships within the framework between the Self Indulgence Archetype, experiential factors and Experience Episodes.

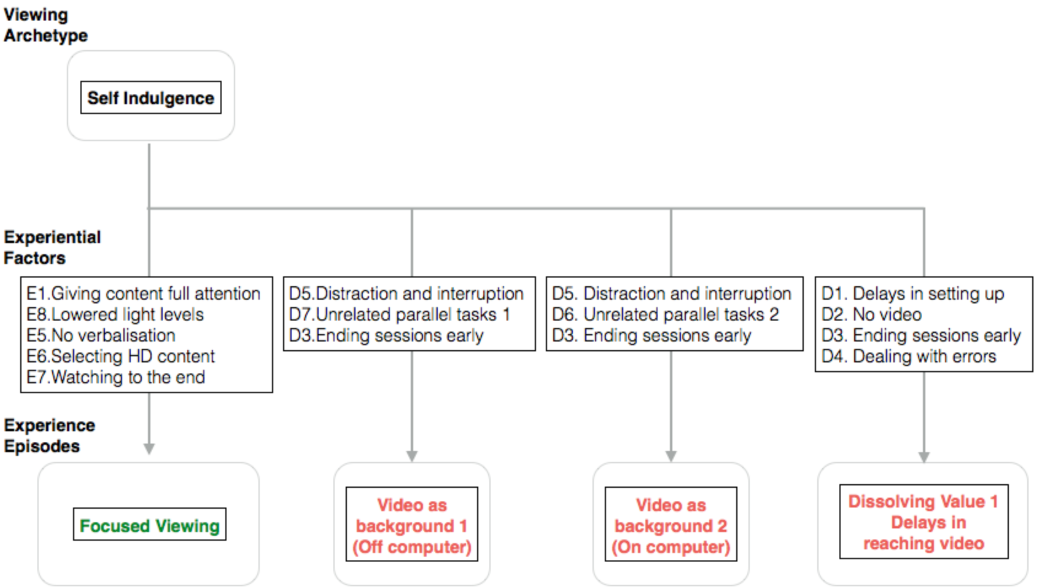


Figure 7.14. Contributing experiential factors that characterise the Experience Episodes created within the Self Indulgence Archetype.

7.4.4 Framework elements for Sharing Space But Not Content

Sharing Space But Not Content offers the user a choice between attempting to create a focused solitary experience or to turn that experience into a social one. When these sessions go well they are observed to be very enjoyable. However the presence of other people increases the possibility for interruption and annoyance for those attempting to create solitary experiences. Apart from technical issues with reaching content, interruption was the main cause for dissatisfaction and negatively rated experiences. Due to the possible viewing configurations around shared or solitary viewing, Sharing Space But Not Content allows for the widest range of Experience Episodes compared to any of the other Archetypes investigated. Figure 7.15 defines the relationships proposed within the framework between the Sharing Space But Not Content Archetype, experiential factors and Experience Episodes.

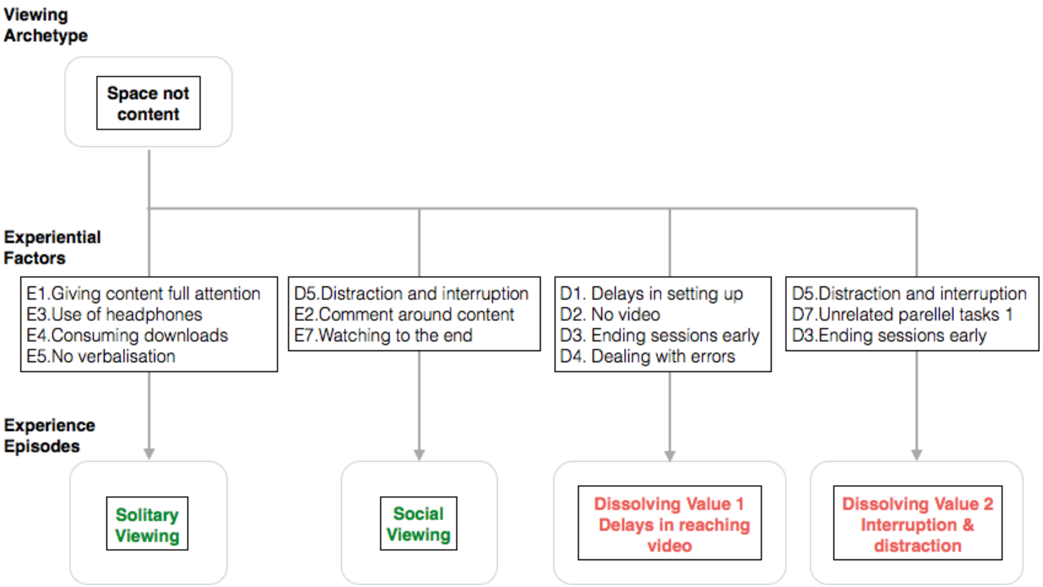


Figure 7.15. Contributing experiential factors that characterise the Experience Episodes created within the Sharing Space But Not Content Archetype.

7.5 A framework and model for contextualised viewing

The aim of this chapter was to provide a framework of structurally related concepts that can be used by future systems to model and adapt to contextualised viewing experiences.

The framework components discussed within the chapter have included concepts for contextually situating the viewing within an Archetype and explained concepts for defining those situations through the formation of derived context.

Within each Archetype, the experiential factors indicative of particular types of Experience Episode (both related to negative and positive experiential outcomes) have also been described. By identifying the presence of particular factors, a future system could model the projected experience outcome. This level of awareness provides the opportunity to additionally take action to adapt the situation in order to improve the viewing experience outcome for the user.

7.5.1 The contextual viewing experience Framework

A high level visual representation of the entire proposed framework is provided in Figure 7.16.

- Derived aspects of context are formulated from low-level contextual information (1). In an implemented system this could be in the form of sensor inputs from the environment, user feedback, device status, remote data services, system rules or data usage models.

- Derived context defines specific high-level elements of the situation related to location, socialness and temporal context. The presence and status of derived context information defines viewing as occurring within a given viewing Archetype (2).

- Within given Archetypes a range of Experience Episodes are possible (3).

- The experiences created are indicated by the presence of specific groups of experiential factors that manifest during viewing (4).

- Experiential factors are high-level descriptors of technical, environmental or behavioural aspects that have an influence on experience, however their presence too can be identified within the Viewing Archetype from low-level contextual information (5).

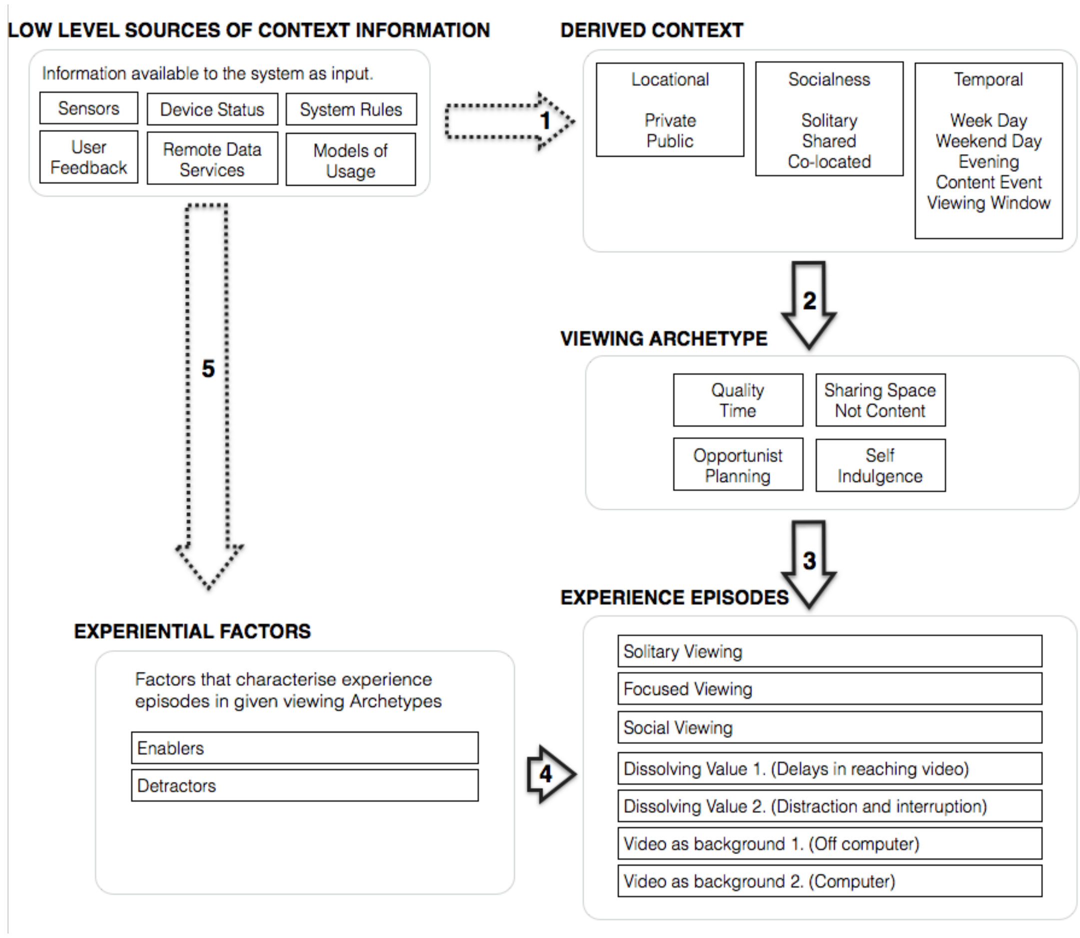


Figure 7.16. A framework for contextualised viewing experience.

7.5.2 A proposed model for adaptation.

Using the framework as a basis, it is additionally possible to derive a simple high-level system model to convey how adaption might work. It needs to be stressed that based upon the framework there are many possible system solutions, however by laying out a proposed approach the author hoped to demonstrate the utility of the framework as a method for considering context within the domain of viewing UX. A high-level representation for a model of how adaption might work using the elements of the framework is provided in Figure 7.17 .

- Derived aspects of context are formulated from low-level contextual information (1).
- From this information the current Viewing Archetype is identified (2).
- Based on initial consideration of the experiential factors present (3) the system makes a projection of the current Experience Episode (4).
- The system targets the experiential factors relevant to the selected Episode (5).
- In positive Episodes the system may take adaptive action to further enhance the relevant enabling factors indicative of that Experience Episode (6).
- In negative Episodes the system may take adaptive action to abate detracting factors indicative of that Experience Episode (7).
- Alternatively in negative Episodes the system may target a more positive outcome also achievable in the current Viewing Archetype (8).
- The system then takes further adaptive action to introduce new enabling factors into the experience in order to alter the outcome. The frequency with which the process shown in the model is repeated represents the reaction time of the system model to adapt to changes in context (9).

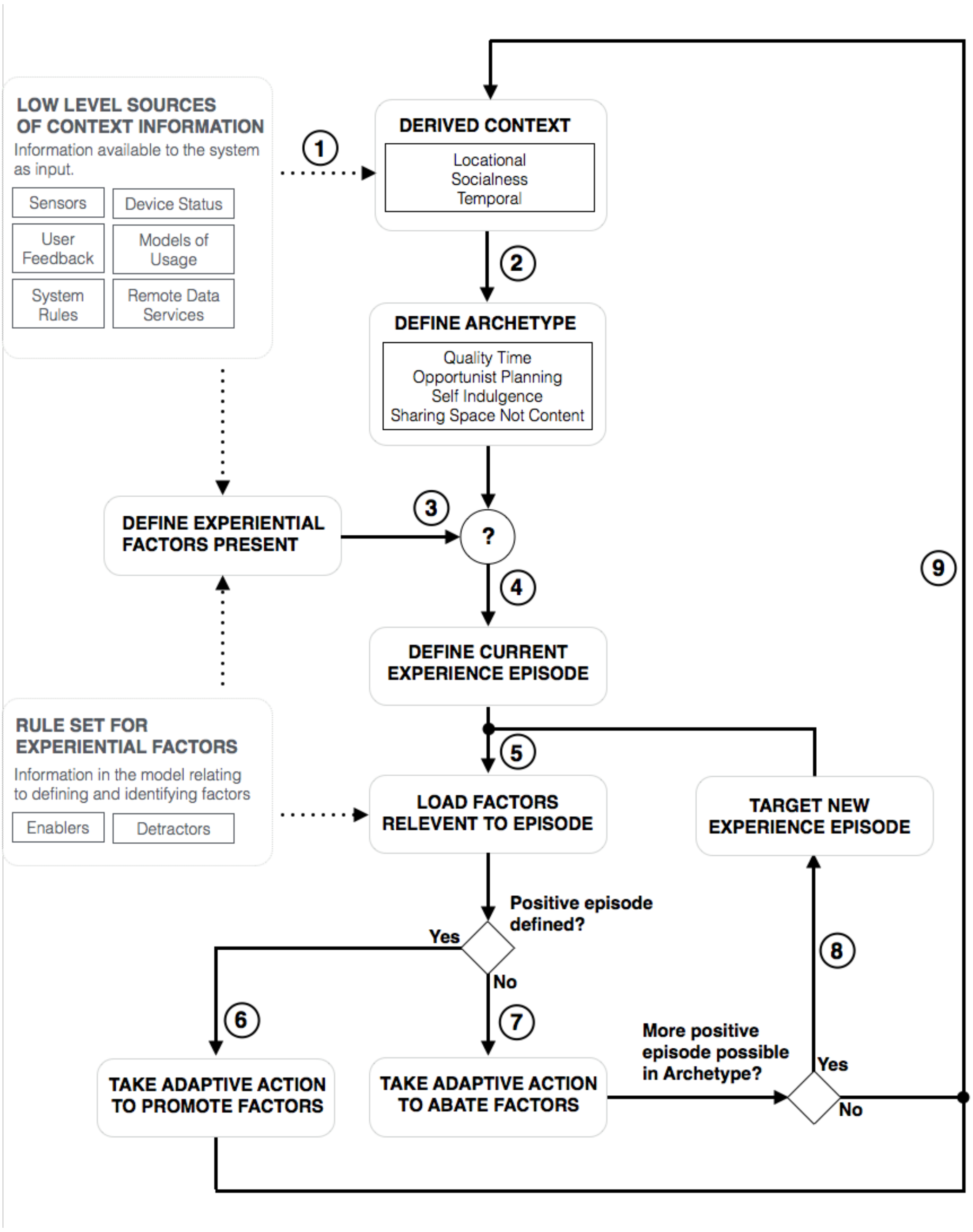


Figure 7.17. A proposed model for adaption in relation to contextualised viewing experiences.

7.6 Information for designers

The model for contextualised viewing offers a tool to inform the development of the system architecture within contextual aware video applications and services. However open questions remain around what opportunities to improve UX the model would present for developers and designers. Furthermore what specific inferences and related actions should an enhanced system take in order to support UX?

As the framework alone does not convey how experience designers might utilise the information it contains within concept design, this section is aimed at providing additional resources for designers through which to convey how the model might be best utilised. The method selected to convey such information is through the use of scenarios.

7.6.1 Scenarios: Considerations and approaches

Scenario-based design (Microsoft, 2007; Ambler, 2012) is a user-centred design approach that attempts to change the focus of design from defining system operation to describing how people will use a system.

Scenarios have been described as descriptions of imagined future product use (Fulton Suri & Marsh, 2000), and as a technique to concretely describe use of a future system at an early point in a development process (Rosson & Carroll, 2002). Their power is the ability to communicate possible futures by depicting the imagined interactions between a user and a yet to be developed system. The method has been used as an effective way to capture, analyse and communicate information about both future user needs and system operation (Aftelak, et al., 2007). Through this approach, scenarios offer a number of key advantages over traditional design requirement generation processes, such as:

- Through exploratory design (Mäkelä & Battarbee, 1999), future needs of the users in terms of supporting activities and related user experiences can be envisioned in isolation from defining the underlying technology.

- The surrounding context of the narrative stories within scenarios allows designers to see concepts and ideas beyond the limits of familiar technology and solutions.

- Scenarios represent an excellent communication tool, and as such have great utility in communicating user needs and identifying problem spaces (Mitchell, 2005).

In the context of this research, scenarios offered an excellent way to provide a design resource that operationalizes the contextual framework for designers and technologists. The activity afforded the creation of some initial concept solution ideas. These could then act as the needed guidance for future experience designers in terms of bringing the framework to life.

7.6.2 Scenarios: Development

Rosson and Carrol (2002) layout a process through which to conduct scenario based design (see Figure 7.18). Scenario based design is iterative in nature and before moving on to envision concept solutions we firstly need to convey the problem space. Rosson and Carroll promote the idea of a “Root concept” which sets the groundwork for understanding the problem. This grounding provides the information needed to confidently make claims about user experience. The author argues that the framework for contextualised viewing together with the insights and conclusions drawn from the studies documented in this research provide an excellent alternative grounding through which to understand the problems users incurred. Therefore this was used as a basis to explore scenarios.

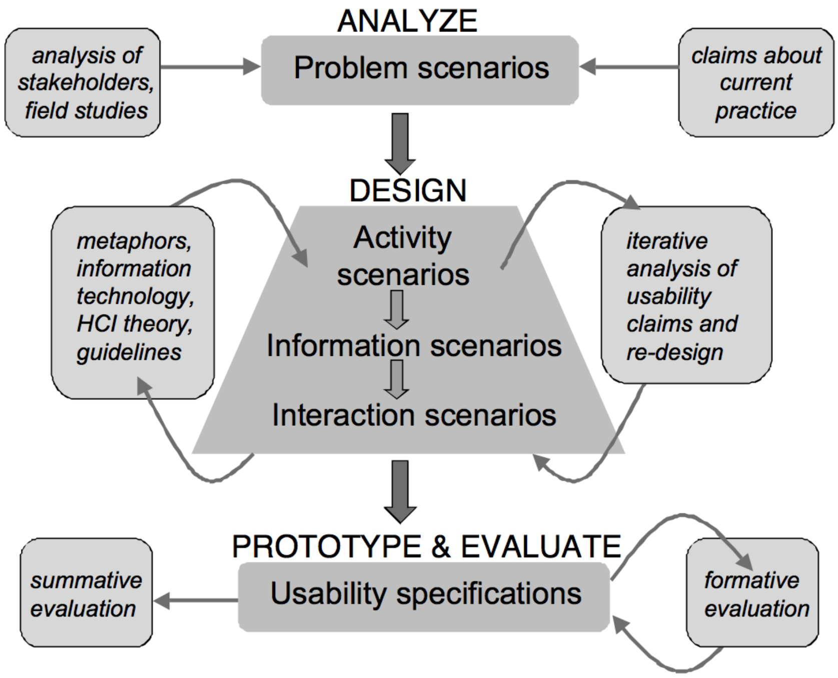


Figure 7.18. A framework for scenario-based design. (Rosson & Carroll, 2002, p. 1042).

Following the scenario-based design approach an example scenario was created. This focused closely on depicting Archetype viewing situations and the Experience Episodes that occur within them. It followed best practice principles for scenario creation (Fowler, van Helvert, Gardener, & Scott, 2014) in that it:

- has narrative
- is bounded (has a scope)
- describe actors, activities and objects
- sits within a timeline
- is generated for a specific purpose, (in this case design communication and analysis)

The scenario had three inputs. These are depicted in Figure 7.19. Firstly was the relationship to the elements of the framework for contextualised viewing that derive viewing context. In an idealised future we would expect to see the framework employed to characterise the viewing situation Archetype and Experience Episode currently underway. The scenario depicts how this occurs in relation to the model.

A second related input from the framework was information from experiential factors. By identifying which experience enabling and detracting traits exist within a given Experience Episode, a future system could identify appropriate ways to take adaptive action in support of better viewing experiences.

The third and final input was from conceptual design. This was a creative input and sat outside of the framework, but represents ideas for the types of action future systems could take in support of better viewing experiences.

Opportunities for data capture.

The capability to contextualise and personalise experiences relies heavily on a system's ability to understand user behaviours and preferences. Data collection is therefore required to build a preference model. As a further resource for designers working in this field, creative opportunities as to how such data could be captured was also considered within the scenario. It is envisioned that any implementation of the framework for contextual viewing would sit alongside (and inform) a traditional preference modelling system. Therefore by considering data capture, opportunities for how the framework could integrate with traditional personalisation technologies can be demonstrated.

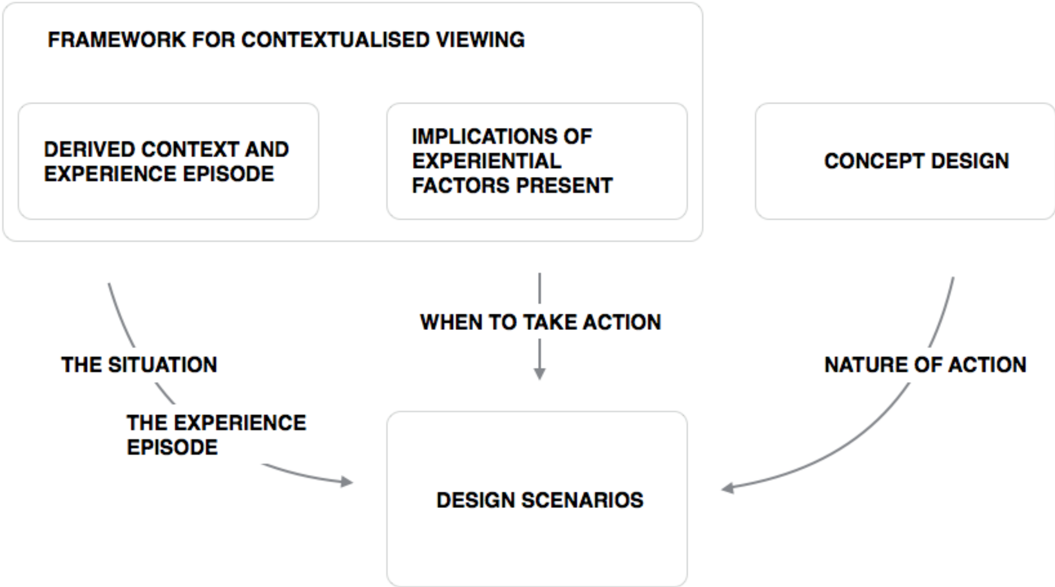


Figure 7.19. Inputs into the design scenarios.

A note on presentation of the scenario

The scenario story follows a set of characters through a day, and is broken down into individual tableaus. Every tableau represents an example of a specific Experience Episode (Chapter 6, Table 6.34) conducted within a specific viewing situation Archetype. This way of both depicting stories and organising scenarios has precedence in the literature (Aftelak, et al., 2007). As such the scenario represents depictions of the real world viewing experiences, associated tasks, and user behaviours observed during the studies undertaken throughout this research.

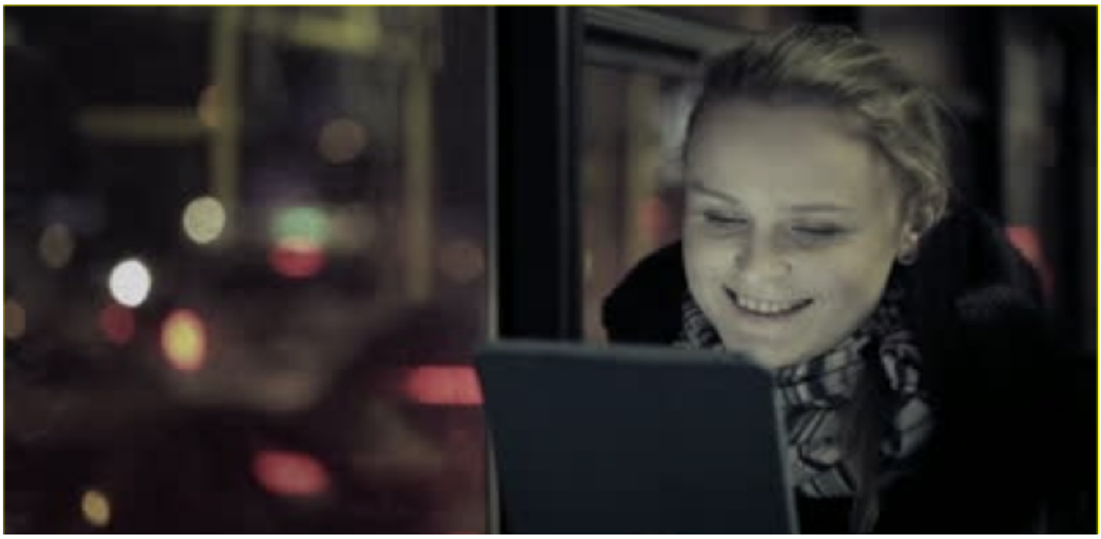
A presentation scheme for the scenario has been derived in order to both provide transparency in terms of the functionality of the model and to showcase it's utility in terms of improving viewing UX. In instances where the model is envisioned to have intervened into the viewing experience in some way, (whether that be to infer some aspect of the situation, take action to manipulate the user experience or to collect user data for purposes of personalisation) these junctures have been clearly highlighted in order to inform the reader.

These are presented at the end of each tableau in the context of the model. The notation used throughout is provided in Table 7.4.

Notation used in the scenario		
Description	**Identifier**	**Example**
Point at which the framework identifies the viewing situation Archetype.	SIT	…watch TV $_{\text{SIT}}$
Point at which the framework identifies the Experience Episode.	EPS	…onscreen guide $_{\text{EPS}}$
Point at which the framework takes some form of action to adapt the viewing experience.	ACT	…the noise $_{\text{ACT}}$
Point at which an opportunity to collect user data arises.	DATA	…interruptions $_{\text{DATA}}$
Example of notation when more than one event of each type occurs in a tableau.	…1, …2	…the noise $_{\text{ACT1}}$ …onscreen guide $_{\text{ACT2}}$

Table 7.4. Notation used throughout the design scenario

Design Scenario. A busy Friday.



Graham and Sasha are a young professional couple who recently moved in together. Graham is a freelance copywriter and works from home. Sasha works in marketing and commutes into the city by train and bus every morning. Graham's friend David also appears in the story. It's Friday and both Sasha and Graham are working today.

S1. Graham tidies up.

Viewing Archetype	Experience Episode
Self Indulgence	Video as background 1 (off computer)

Table 7.5. Scenario summary for tableau S1.

It's 7.30am and Sasha is leaving the house to catch her train. Graham is eating breakfast in the kitchen and waives her off. Graham puts breakfast television on the TV in the kitchen $_{\mathbf{SIT}}$. He watches for 5 minutes as he finishes and then potters around cleaning up the breakfast items, listening out for snippets of headline news and some of the discussions and interviews $_{\mathbf{EPS}}$. As he loads the dishwasher at the other end of the kitchen the TV starts to provide audio descriptions of the visual elements of the content on screen $_{\mathbf{ACT1}}$. An expert being interviewed about the state of the economy grabs Graham's attention and so he goes back to the TV to watch the report just as it's ending. He uses the system's *smart step back* feature and the video automatically steps back to the start of the interview $_{\mathbf{ACT2,\ DATA}}$. He finds the interview useful and plans to use some of the information in his work.

Viewing Archetype identification

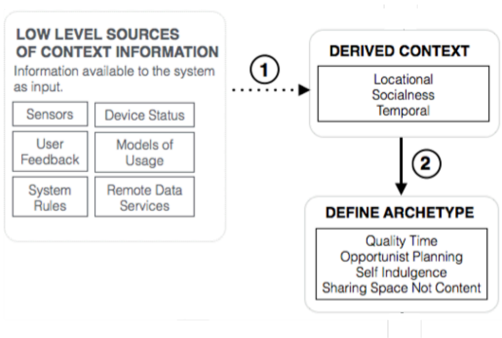


Figure 7.20. Archetype Identification within the model.

- **SIT**. The TV Graham is using is connected to the home Wi-Fi, and when first setup it prompted him as to it's location in the home which he gave. Additionally a camera array and infrared sensor built into the top of the television identifies only one person in the room. The system uses this context information to derive:

  Location is private.

  Socialness is solitary.

  Temporal context is weekday daytime.

  The viewing situation is therefore inferred as **Self Indulgence.**

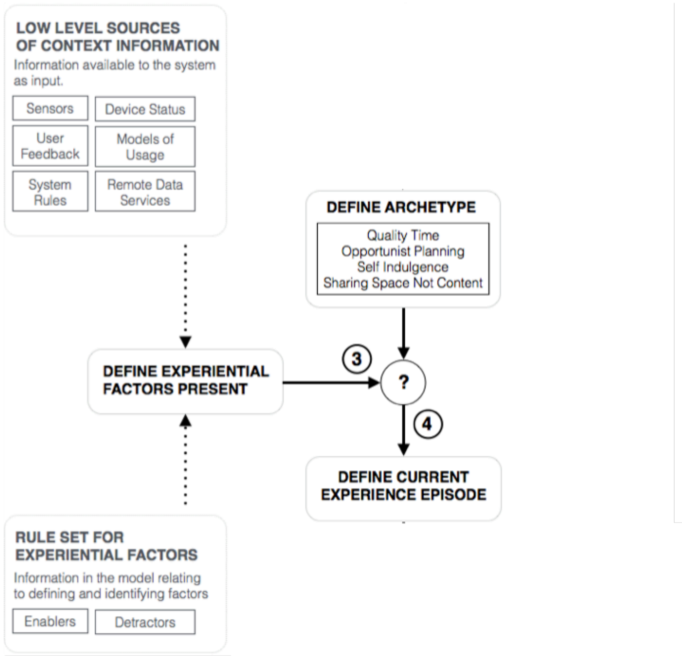


Figure 7.21. Experience Episode identification within the model.

- **EPS**. Graham is walking around, clearing the breakfast items. There are times when he totally looses focus on the TV at the other end of the room. The camera array and infrared sensor confirms Graham's body and head movements, which show walking around and gaze focus away from the TV. From this low level context information the system is able to derive the presence of:

  Distraction and interruption, (D5).

  Unrelated parallel tasks 1, off computer, (D7)

  The presence of these experiential factors within the Self Indulgence viewing situation are enough information to discern that the current Experience Episode is **Video as Background 1 (Off computer).**

System Actions

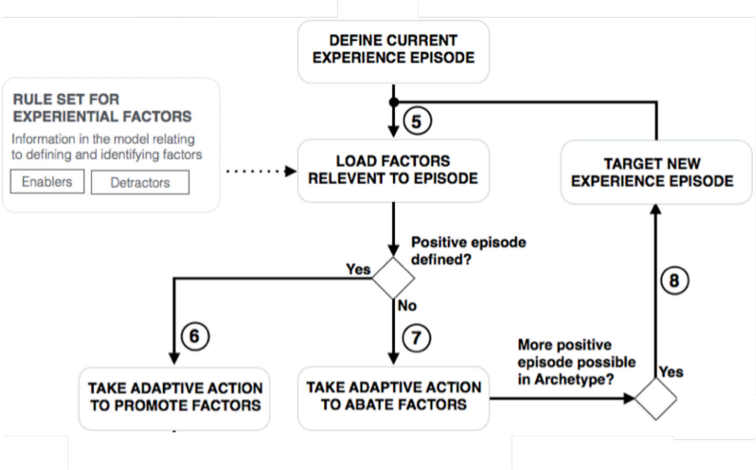


Figure 7.22. System Actions within the model.

- **ACT 1.** The system takes action to provide better focus on content and abate the experience issues associated with the current Experience Episode. The system therefore provides audio description of the on screen action to provide context when the user is not focused on the TV. The system takes this action to abate:

  Distraction and interruption, (D5).

  Unrelated parallel tasks 1, off computer, (D7)

  Which are both key experience detractors within negative Self Indulgence viewing situations.

- **ACT 2.** The system provides the smart rewind function to offer Graham the chance to step back in meaningful chapters of content throughout the duration of the parallel activity. Steps are pre-defined as timestamps in the content metadata and relate to semantically meaningful junctures in the show such as changes of topic or scene change. The user can step back through to a specific chapter in order to review or re-watch. The system takes this action to abate:

Distraction and interruption, (D5).

Unrelated parallel tasks 1, off computer, (D7)

Which are both key experience detractors within negative Self Indulgence viewing situations.

Preference data gathering

- **DATA.** The system logs Graham's predilection to use the step back feature and logs it as a feature preference in his profile relating it to the current Viewing Archetype and Experience Episode.

S2. Sasha is stressed.

Viewing Archetype	Experience Episode
Opportunist Planning	Dissolving Value 2 (Interruption and distraction)

Table 7.6. Scenario summary for tableau S2.

Sasha is on her train and travelling into the city. As usual she is using the time to catch up on one of her favourite drama shows which she regularly downloads onto her phone to watch when she is on the move $_{\mathbf{SIT,\ EPS1}}$. Before she starts to watch, the system askes if she would like to receive service updates on her journey? $_{\mathbf{ACT1}}$ She agrees $_{\mathbf{DATA1}}$ plugs in her headphones and starts to enjoy the show. The train is making unusually slow progress this morning, then Sasha receives a journey alert at the top of her screen telling her a broken down train is causing delays of 30 minutes! $_{\mathbf{DATA2}}$ The driver makes a number of announcements on the tannoy and Sasha quickly removes her headphones to hear the message and the video automatically pauses $_{\mathbf{EPS2,\ ACT2}}$. The driver gives no more information than the service update. Sasha is going to be late for work. She continues to watch the show and gets updates on the journey throughout. She is quite distracted but does manage to watch it all, in fact the delays means she actually had time to finish the whole episode. **DATA3**

Viewing Archetype identification

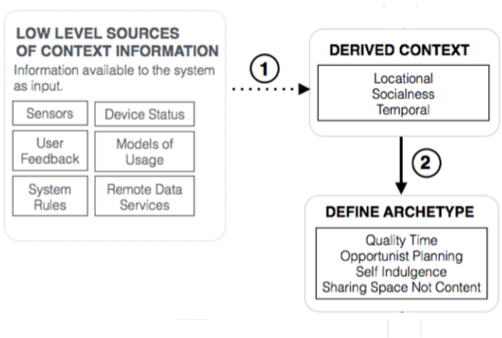


Figure 7.23. Archetype identification within the model.

- **SIT**. The mobile device Sasha is using gathers information regarding the available Wi-Fi networks, (including the lack of access to it's home network). The busy wireless environment in terms of Bluetooth devices and secured private networks additionally allows the system to infer the immediate environment has lots of personal devices in close proximity. Her device also identifies the train operator's Wi-Fi as a known network. Finally the device relates locational information to Tanya's place profiles for where she usually watches video on her mobile. These include on the train. The system uses this context information to derive:

  Location is public.

  Socialness is solitary.

  Temporal context is specific learnt viewing window.

  The viewing situation is therefore inferred as **Opportunist Planning.**

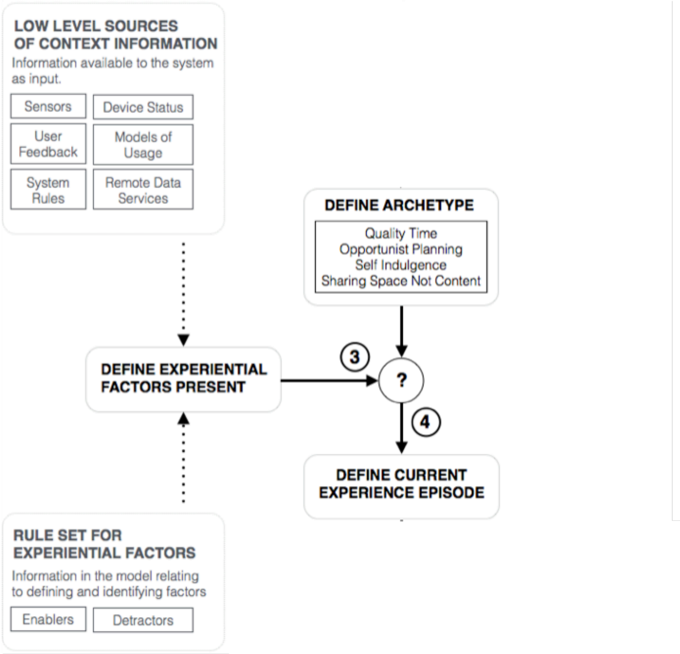


Figure 7.24. Experience Episode identification within the model.

- **EPS 1**. The possible positive Experience Episodes within Opportunist Planning viewing situations are limited. The system targets the best possible experience outcome, which is the creation of **Solitary Viewing.**

- **EPS 2.** The face recognition camera built into the mobile device senses when Sasha is no longer looking at the screen. Additionally when Sasha removes the headphones the microphone on the mobile device picks up the high levels of conversation between passengers on the train and the tannoy messages. From this low level context information the system is able to derive the presence of:

  Distraction and interruption, (D5).

  And the absence of:

  Using Headphones, (E3).

  The presence of these experiences modifiers within the Opportunist

Planning viewing situation are enough information to discern that the Experience Episode has switched to **Dissolving Value 2 (interruption and distraction).**

System Actions

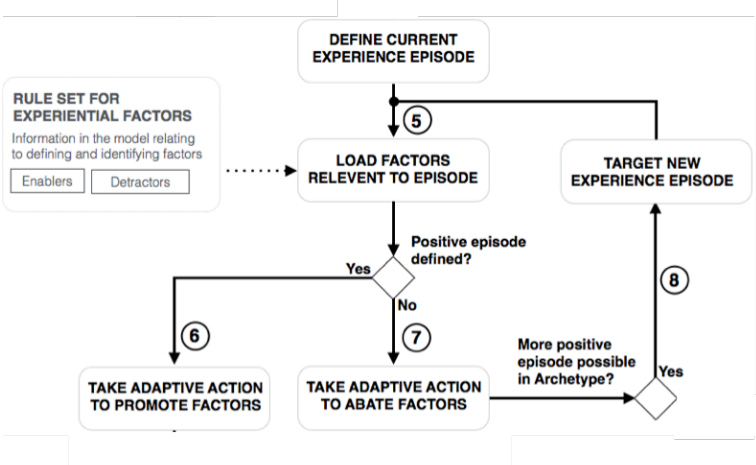


Figure 7.25. System Actions within the model.

- **ACT 1.** The system understands that when travelling on a train, user actions such as checking the timeliness of the train, noting the current location and looking out for your own station are all common. However they also represent parallel tasks to video consumption and create split focus. The system attempts to abate these distractions by providing subtle yet useful information updates within the context of the video itself. In this way the system can better manage the levels, frequency and nature of interruption in order to attempt to maintain a better user focus on the content than may otherwise be possible, promoting:

  Giving content full attention, (E1).

  Which is a key experiential enabler within the current target Experience Episode of Solitary Viewing.

- **ACT 2.** The system pauses the content as an abatement strategy to the loss of focus and removal of headphones. This gives the maximum opportunity for the user to re-engage with the content once the distraction has passed, abating:

Distraction and interruption, (D5).

Which is a key experiential detractor within negative Opportunist Planning viewing situations.

Preference data gathering

- **DATA 1.** The system logs Sasha's predilection to use journey progress updates and logs it as a feature preference in her profile relating it to the current Viewing Archetype and Experience Episode.

- **DATA 2.** The system logs the delay in the journey and will use this information in the future, (together with other data on Sasha's typical commute duration) to consider content length in the recommendations it makes. The data is logged against current Experience Episode and Viewing Archetype.

- **DATA 3.** The system logs Sasha's consumption of the video as an implicit preference within her profile, relating the content preference to Viewing Archetype and Experience Episode.

S3. Spending time with David.

Viewing Archetype	Experience Episode
Sharing Space But Not Content	Social Viewing

Table 7.7. Scenario summary for tableau S3.

It's early afternoon and Graham's good friend David has popped over to organise a night out for later in the week. They are in the Kitchen. David is watching a football punditry show on the kitchen TV whilst Graham is checking on his tablet via his favourite social media website if any of their other friends wish to join them for the night out $_{\mathbf{SIT,\ EPS1,\ DATA1}}$. Graham looks up and sees a fantastic goal scored on the TV. David tells him about the goal scorer and then compares him to another striker he really admires.

As they chat, Graham starts to look up the other player on his tablet through an Internet search $_{\mathbf{EPS2}}$. He receives a growl on the tablet asking if he wants to "splash" the information? $_{\mathbf{ACT1}}$. He agrees and information about the player, statistics comparing his goal scoring record to others, and information on his next match are all presented as an ambient peripheral view around the parameter of the kitchen TV$_{\mathbf{ACT2,\ DATA2}}$. They continue to chat, commenting on the goals and analysis shown on the TV whilst relating it to the information presented and updating in the peripheral view. In parallel, Graham remains logged in on the social media site via his tablet so that he can check from time to time if any of their friends responded to his invite. The system proposes an updated social media status related to watching the TV show, but Graham declines. None of his social media information is splashed to the kitchen TV$_{\mathbf{ACT3}}$. Graham and David spend a nice hour together, watching, chatting and surfing until the programme ends $_{\mathbf{DATA3}}$.

Viewing Archetype identification

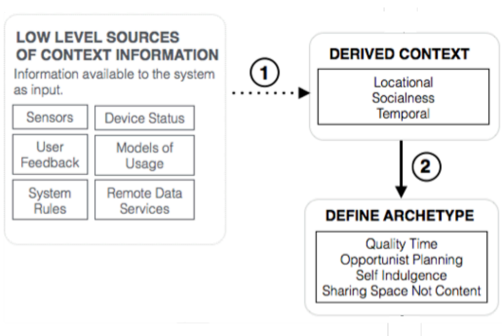


Figure 7.26. Archetype Identification within the model.

- **SIT**. The TV David is using is connected to the home Wi-Fi, and when first setup it prompted Graham as to it's location in the home which he duly gave. Additionally a camera array and infrared sensor built into the top of the television identifies that two people are in the room. Through the home network the system is also aware of the tablet being used by Graham and the unrelated content he is consuming. The system uses this context information to derive:

  Location is private.

  Socialness is co-located.

  Temporal context is week daytime.

  The viewing situation is therefore inferred as **Sharing Space But Not Content.**

Experience Episode inference and targeting

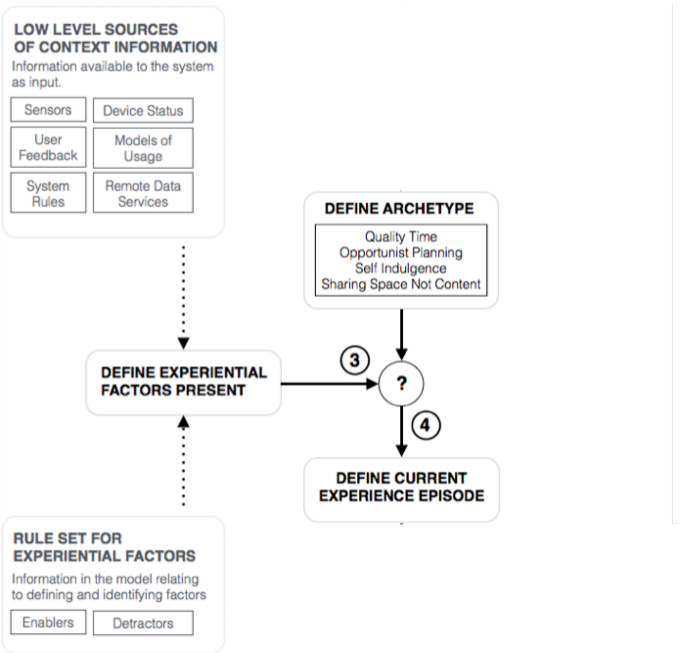


Figure 7.27. Experience Episode Identification within the model.

- **EPS 1**. Initially there is no conversation in the room between David and Graham. David is focused on the TV, whilst Graham is focused on his own activity with the tablet. The microphone array built into the TV is able to discern the high levels of non-verbalisation. The camera array and infrared sensor is also able to confirm David's body and head movements that show he is giving gaze focus to the TV, whilst Graham is focused on his tablet. From this low level context information the system is able to derive the presence of:

  Giving content full attention, (E1)

  No verbalisation, (E5).

  The presence of these experiences modifiers within the Sharing Space But Not Content viewing situation are enough information to discern between the Experience Episode of Solitary Viewing and the other Experience Episodes possible in this Viewing Archetype. The system therefore infers the current Experience Episode to be **Solitary Viewing.**

- **EPS 2**. Conversation between David and Graham starts. David's focus splits between the content and Graham as they chat. Graham's focus is split between David, the TV and his tablet. Then Graham searches for a topic related to the content on the TV. The microphone array built into the TV is able to discern the high levels of conversation. The camera array and infrared sensor is also able to confirm David's body and head movements that show he is splitting gaze focus between the TV and Graham. The camera array also picks up David's change in gaze focus. Through the home network the system is also aware of the tablet being used by Graham and the related content he is searching for. From this low level context information the system is able to derive the presence of:

  Distraction and interruption, (D5).

  Comment around content, (E2).

And the absence of:

Unrelated parallel tasks 1, off computer, (D7)

The configuration of these experiential factors within the Sharing Space But Not Content viewing situation are enough information to discern between the Experience Episode of Social Viewing and the other Experience Episodes possible in this Viewing Archetype. The system therefore infers the current Experience Episode to be **Social Viewing.**

System Actions

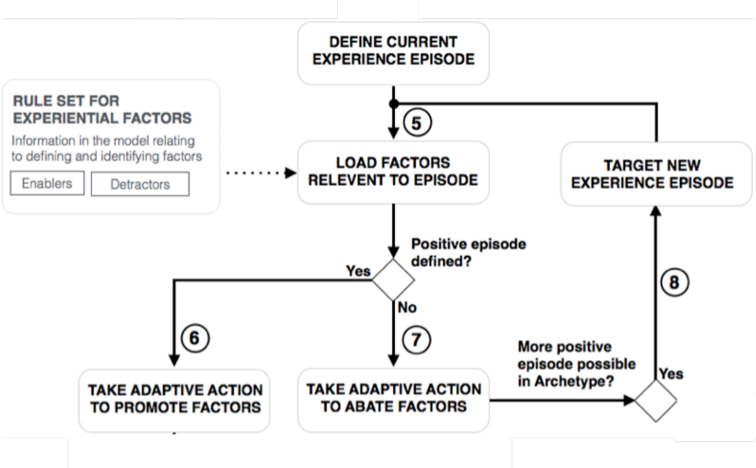


Figure 7.28. System Actions within the model.

- **ACT 1.** The system uses a growl alert on Graham's tablet to alert him to the possibly of sharing the related content he is searching for. It takes this action to encourage conversation around the content, promoting:

  Comment around content, (E2).

  Which is a key experiential factor in the target Experience Episode of Social Viewing.

- **ACT 2.** When Graham agrees to share content the system locates relevant data on the Internet. It uses collaborative filtering search mechanisms to find content other users also searched for and consumed in similar situations when watching similar content. The information is presented as a peripheral display using ultra short throw projector technology built into the edge of the kitchen TV. It takes this action to encourage conversation around the content, promoting:

Comment around content, (E2).

Which is a key experiential factor in the target Experience Episode of Social Viewing.

- **ACT 3.** As Graham took the initial step to foster social viewing the system takes further action to initiate a wider social experience, but Graham declines. The system is able to use information regarding the relevance of related content to the video, Graham's sharing preference settings and his explicit responses to data sharing requests to ensure privacy and protect his private data.

Preference data gathering

- **DATA 1.** The system logs David as a new user based on face recognition. The new profile now starts to build-up information based on David's preferences and actions.

- **DATA 2.** The system logs Graham's predilection to respond to growl alerts, relating it both to the Viewing Archetype and Experience Episode.

- **DATA 3.** The system logs the fact the content was watched to the end credits in both Graham's and David's preference data relating it both to the Viewing Archetype and Experience Episode.

S4. A relaxed evening.

Viewing Archetype	Experience Episode
Quality Time	Focused Viewing

Table 7.8. Problem scenario summary for tableau S4.

It's Friday night and Sasha and Graham are unwinding on the couch. Graham suggests they watch a new natural history programme he saw advertised about the Amazon $_{\textbf{ACT1}}$. Sasha enjoys nature programmes too and agrees. Graham switches on the main TV $_{\textbf{SIT, EPS}}$ in the living room and selects the channel the programme is on in the EPG $_{\textbf{DATA1}}$. Recommended content for the couple from this provider is presented in parallel to the programme guide and the nature programme of interest happens to appear in this area $_{\textbf{ACT2}}$. Graham starts the show, which plays in HD, also the lights lower in the room automatically $_{\textbf{ACT3, DATA2}}$. The show is amazing with panoramic shots over the forest canopy, and inspiring music. Sasha and Graham are transfixed, saying very little to each other during the programme. They both really enjoy the show and decide to *series link* it so they don't miss it $_{\textbf{DATA3}}$.

Viewing situation identification

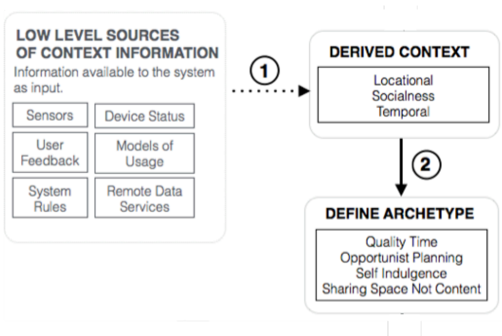


Figure 7.29. Archetype identification within the model.

- **SIT**. The TV Graham and Sasha are using is connected to the home Wi-Fi, and when first setup it prompted Graham as to it's location in the home which he duly gave. Additionally a camera array and infra-red sensor built into the top of the television identifies that two people are in the room and that their head and body movements infer they are both giving gaze focus to the TV. Additionally the time of day indicates that the couple are in a time period where they consume their most focused viewing. The system uses this context information to derive:

  Location is private.

  Socialness is shared.

  Temporal context is evening routine onset.

  The viewing situation is therefore inferred as **Quality Time.**

Experience Episode inference and targeting

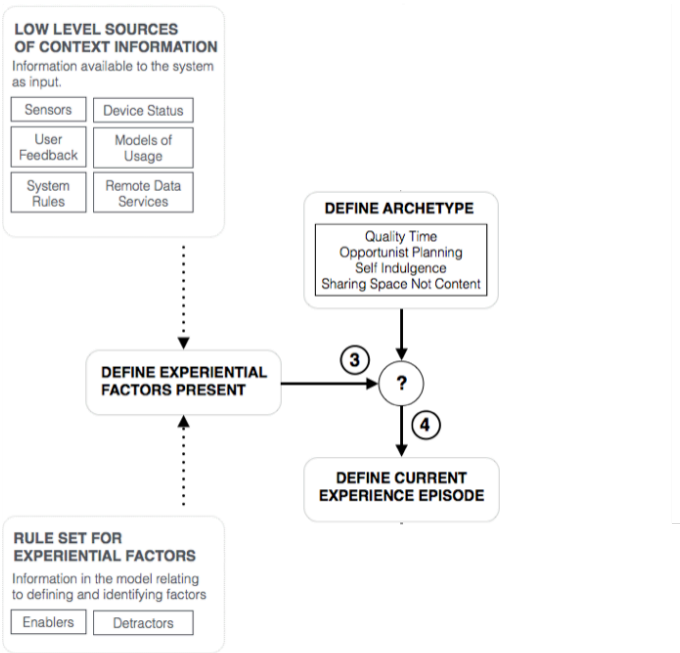


Figure 7.30. Experience Episode Identification within the model.

- **EPS**. Sasha and Graham are both focused on the TV. Also there is little conversation between the couple as they settle down to watch. The camera array and infrared sensor built into the top of the television identifies from their head and body movements that the couple are both giving gaze focus to the TV. The microphone array also identifies minimal levels of conversation. From this deeper context information the system is able to derive the presence of:

  Giving content full attention, (E1).

  No verbalisation, (E5).

  The presence of these experiential enablers within the Quality time Viewing Archetype is enough information to discern that the Experience Episode is **Focused Viewing.**

System Actions

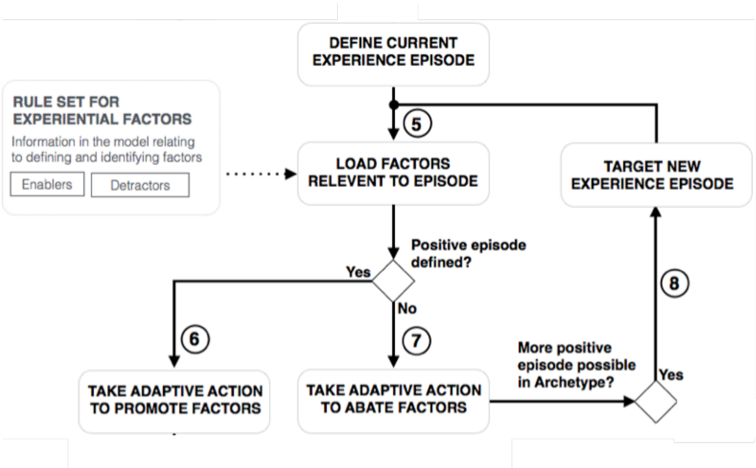


Figure 7.31. System actions within the model.

- **ACT 1.** The system can provide more relevant advertisements for content by using user preference profile information. In this case the nature show advert was shown to Graham due to his past preference for this type of content. Surfacing recommended content in this way encourages more engaged and enjoyable experiences through suitable and well-matched content selections promoting:

Giving content full attention, (E1).

Which is a key experiential enabler within the target Experience Episode of Focused Viewing.

- **ACT 2.** The system provides recommendations and other content likely to be of interest to the couple. As navigation into different areas of the menu interface is conducted, subsets of the recommendations can be presented which are more relevant to the genre or channel being explored. This can short cut navigation and get users to content of interest more quickly, abating:

  Delays in setting up, (D1).

  Which is a key experiential detractor within the Quality Time Viewing Archetype.

- **ACT 3.** The system plays the content in HD and lowers the light levels, promoting:

  Selecting HD content, (E6).

  Lowering the light levels, (E8).

  Which are both key experiential enablers within the target Experience Episode of Focused Viewing.

Preference data gathering

- **DATA 1.** The system logs Graham's channel preferences and navigation strategies in his profile against the current viewing situation and Experience Episode. As this information builds up it can be used to improve both his navigation experience and accuracy of recommended content.

- **DATA 2.** The system logs Graham's selection of the content as an implicit preference in both of the couple's profiles, relating it to the current Viewing Archetype and Experience Episode.

- **DATA 3.** The system logs the couple's consumption of the content as an implicit preference and the decision to series link the show as an explicit preference in both of the couple's profiles, relating it to the current Viewing Archetype and Experience Episode.

7.6.3 Suggested opportunities for using the Framework

As well as providing examples of how the framework could positively impact future viewing UXs, this section includes four suggested approaches for how the framework could be usefully employed by teams within the design process. The recommendations are based on the author's own experiences of working on technology projects within design teams, and also draws on best practice approaches from the literature.

Framework as a focus for multi-disciplinary design activity.

One of the reasons why user centred design is so infrequently applied to the design of technology is due to the designer's own specialisation in code development rather than HCI (Jameson, 2008). By including a multi-disciplinary cooperative team right from the start of product design and development, user needs and insights can inform and steer the development of the technical architecture. However as Baltrunas et al. (2011b) highlights there are currently often mismatches in the outputs generated from traditional HCI methods and the inputs needed for technical design.

The framework's main benefit is therefore to provide a central reference for multi-disciplinary teams on which to focus their design activity. This is powerful, as the individual components of the framework can each by considered from a user experience design, technical architecture design and hardware implementation perspective. A major benefit of using the framework is therefore to align the design outputs from all disciplines to relevantly consider and address the user needs and design problems represented in the framework.

Framework to inform a scenario based design approach.

Within this chapter a scenarios based approach has been initiated in order to begin consideration of how the framework could enhance viewing user experiences. Scenarios are a powerful way to explore experience design as they allow concrete concepts for future product use to be imagined without the constraints of current technology. The framework offers a useful tool to inform and drive scenario development as it sits at a technology agnostic process level whilst documenting the activities needed to understand viewing context information and act on it. Therefore the framework offers a structured approach through which to approach ideation.

Framework as a focus for technical roadmap creation.

Whilst design ideation can occur without the constraints of current technology, it is still important technology developments continue to evolve towards support of better viewing user experiences.

Smarter technologies will be needed to elicit the user and context information required to inform the framework concepts. However the evolution of new technology can be a long term activity and needs to be coordinated in a wider technical roadmap in order to deliver capabilities as and when they are needed in a design programme's lifecycle.

The framework provides an information source for exploration of future technology needs and a focus for planning and directing technical design effort.

Framework to identify real contexts of use for user testing.

Evaluating designs with users as early as possible offers the best opportunity to both identify and solve design problems, as well as to uncover new user requirements. This approach has been shown to improve software quality (Pettersson & Nilsson, 2011). The studies conducted in this research additionally show that viewing experience is explicitly and intrinsically linked to the context in which viewing is carried out. This provides further strong evidence together with existing literature (Trivedi & Khanum, 2012) to suggest conducting user research evaluations in the real contexts of use is critical. This is very important from the perspective of confirming the enhancement of user experiences through adaptive design, as the contextual conditions for that adaption to occur must be replicated in order to observe and confirm the impact on user experience.

The framework can therefore assist both in describing the viewing contexts in which video consumption occurs and the contextual factors which need to be considered in order to replicate real world viewing circumstances. Through this approach authentic settings in which to evaluate design concepts with users can be identified.

7.7 Conclusions

Within this chapter the aspects of viewing context and viewing experience investigated during the research phases of the study have been integrated into a framework.

The framework describes contextualised viewing experience, and explicitly links low-level elements of context information to viewing user experiences in the form of Experience Episodes. Additionally the framework describes the relationship between situation Archetypes and the underlying derived contextual factors that characterise them.

A further aspect of the framework is the integration of experiential enablers and detractors. These behavioural, environmental and technological elements define Experience Episodes through their presence within the viewing sessions conducted within specific Archetypes.

As the framework characterises types of viewing UX and provides definition around when and how these are created, design solutions can be derived which seek contextual awareness through identification of Viewing Archetypes, Experience Episodes and related experiential factors. As way of an example the author provided a proposed model. This represented a concept for how the elements defined in the framework could possibly be implemented as high-level system architecture.

An aspect missing from the model were definitions of the type of adaptive action a future system might take. The model has applicability to a range of applications in which contextual adaption of video services may offer advantages. Therefore solution design is greatly dependent upon the purpose and capabilities of the system being developed. As example, the types of appropriate actions would differ greater between a set top box user interface and a broadcaster focused on providing content streams.

A second aspect, also unaddressed was how the framework could be utilised by design teams to practically inform and guide their activity.

Both of these aspects were addressed through the creation of additional information for designers in the form of scenarios and suggestions opportunities for how the framework could be used. The scenarios provided examples for how viewing experiences could be improved through use of the model. The goal of using scenarios was to bring the framework to life. Through this medium, it is hoped that elements of the framework may be better conveyed to system architects and also that the design possibilities for adaptive systems be made more accessible to experience designers. The suggested opportunities for use of the framework are centred on practical ways in which the framework could add value to design activities. These include use as a focus against which to align multi-disciplinary design activities, use as a concept ideation tool, a focus for technical roadmap creation and use as a reference for viewing contexts when planning user-testing evaluations.

The framework creation in this chapter represents an important step forward in the main research aims, and builds upon the combined research output from the previous studies addressing viewing context and viewing user experience. By the creation of exemplar scenarios based on that framework and associated model, a starting point has been created for future iteration and design work in this space. These should not be seen as the conclusion of the work. Rather they represent a means for setting out a future direction, embodying illustrations for designers of how the situations depicted could be influenced by design.

8 Conclusions

8.1 Reviewing the research

8.1.1 The aims and approaches

The goal of this research was to provide a user centric framework for the interpretation of contextualised viewing experience. Development of the framework encapsulated four aims:

A. To investigate the relationship between viewing context and viewing user experience from a user centric perspective.

   The approach taken was to understand the situations in which people watch video, and characterise the elements that define those contexts and the user viewing behaviours that happen within them.

B. To characterise the influence of contextual factors upon the quality of viewing user experience.

The approach taken was to identify the behavioural, environmental and technological aspects that act as enablers or detractors in the creation of positive viewing user experiences in different viewing contexts.

C. To develop user centred insights into a design reference for viewing context. Designers and developers could utilise the information to inform the design of future video services seeking to develop awareness of the viewing context.

The approach taken was to create a user centred framework for contextualised viewing, which integrates information regarding the influences on viewing UX into a system model built on a user centred understanding of viewing context.

D. Through the development of design references integrate UX knowledge of the adaption strategies that can improve user experiences within specific viewing contexts into design thinking.

The approach taken was to provide practical information examples and suggestions for designers about how to use both the framework as a tool and the user centred knowledge it contains within their design processes.

8.1.2 The study activities

The research activities spanned three studies. The aim of Study 1 was to understand the places in which people watched video and the contextual factors that defined those places as separate viewing situations from the perspective of users. The study identified eight Archetype viewing situations through a literature review and original research. An ethnographic component of the study used direct and user-captured video observation to verify and augment the contextual cues for four of the Viewing Archetypes. These four were identified as representing over 2/3rds of all the viewing captured through a related diary study. Information from this study was integrated into a high level contextual model for viewing context. This referenced 3 significant contextual cues identified by the research. Use of the model was shown to be a plausible method through which the four viewing situations could be positively identified.

Viewing user experience was then investigated using a mixed methods approach. The aim of Study 2, part 1 was to measure viewing UX in context. Two survey measures were collected and found significant differences in the subjective ratings for measured UX when viewing was compared within subjects across Viewing Archetypes. Investigated sessions were then classified using the scale responses in order to identify both a subset of sessions that had achieved negative UX outcomes, and a subset that had achieved positive UX outcomes.

An investigation of the sessions within the two subsets was then carried out through an analysis of complementary user-captured video collected at the same time as the survey responses. The aim of Study 2, part 2 was to characterise viewing UX. This study identified a range of behavioural, environmental and technological factors. The frequency and duration of those factors as observed on video, was compared to the survey ratings. Through this approach factors were identified as indicative enablers and detractors in the creation of viewing experience. Moreover the influence of combining factors when in specific Viewing Archetypes was additionally characterised due to the consistency in experience outcomes that resulted. These were classified as Experience Episodes.

Information from the three studies was then used to inform the creation of a framework for contextualised viewing. This integrated the concepts of Viewing Archetype, Experience Episode, and experiential enablers and detractors. The framework provides a way through which to identify, describe and improve viewing experiences across contexts. Additionally the framework was referenced to develop an exemplar system model for contextual adaptation in order to show its relevance to the generation of technical system design

Finally a small set of design scenarios was created to bring the framework to life as a resource for designers. These creatively illustrated how referencing elements of the framework might influence future UX design. Specifically these depicted examples of service, system and content adaption, in support of viewing experiences carried out in different contexts. The scenarios were augmented with some high-level recommendations for how development teams could utilise the framework in their design processes.

8.1.3 Justification

Video application developers, content broadcasters and video consumption device manufacturers face a number of challenges in ensuring future viewer satisfaction, continued audience engagement and revenue growth. Traditional television has been transformed, audiences fragmented and whole industries disrupted by a host of new entrants offering content to customers in new ways. Customers have near endless content choice and ubiquitous access to view in nearly any situation, on any device (Soares de Oliveira, Batista, & de Souza Filho, 2008).

Methods to address content overload and provide better contextualised and personalised video consumption solutions have been an area of academic discussion for almost 20 years (Burke et al., 2011). Despite a long history of user centred research to understand how and where people watch television and video (see Chapter 2, Section 2.3 for a recap), the technical literature during that time has actually moved away from attempts to model the nature of specific real viewing contexts. Understanding the contextual cues of real influence within specific user domains is difficult and time consuming (Zheng et al. 2012a). Instead developers have attempted to address wider research problems related to developing higher-level generic solutions for contextualisation (Costa &

Goncalves Filho, 2007; Mettouris & Papadopoulos, 2013). In parallel commercial video content providers have concerned themselves with contextualising their services for use on different devices rather than the situations in which people use them, (BBC iPlayer, 2010; BSKYB, 2014b; Amazon, 2014).

The author believes a fundamental weakness exists in the technical approaches to current contextualised system design, in that generic, reductionist and technologist approaches (See Chapter 7, Table 7.1) inadequately consider the reality of real contexts from a user centred perspective. The issue is not one of lack of user insights but rather integration. User centred design is infrequently applied in the design of such technology, due typically to the designers own specialisation in code development rather than HCI (Jameson, 2008). Baltrunas et al. (2011b) highlights the mismatch in approach between ethnographic outputs generated from traditional HCI methods and technical design inputs. Traditional outputs from observation and field trial are argued to not be far reaching or structured enough to adequately shape contextual factors (Mitchell, 2005). As such, traditional UX outputs raise concerns about incompleteness and ambiguity in defining contextual cues. The approach taken in this research has aimed to close that gap somewhat. Transforming ethnographic insights, drawn both from the existing literature and created from original research, into tangible and measured findings about viewing UX and viewing context. Integrating that information into a framework and example system model is an attempt to translate user centred insights into references and tools which developers and system architects can access. Whilst the scenarios generated from that work are aimed at showcasing the possible user benefits and design opportunities that come from referencing the framework in design and development.

8.2 Future Work

8.2.1 Better tools to measure viewing UX are needed.

Whilst conducting the research, one of the major considerations was which method to use to measure viewing UX. Critically the tool selected needed to be relevant to viewing consumption and cope with being applied to the use of multiple types of consumption device, used in numerous different viewing contexts. A review of the literature revealed despite a considerable range of methods being used to evaluate UX (Bargas-Avila & Hornbaek, 2011), no formalised method through which to measure viewing UX across contexts currently exists. This is a considerable issue for viewing device manufacturers and content service distributers. Not only are video services now available on a vast range of devices, but many distributed services are offering “follow me TV” paradigms (HTC, 2014; Johnson, 2007). These actively encourage users to continue their viewing experiences by transiting between different devices as they move through viewing contexts. However there remains no established method through which to measure such experiences.

The author advocates that some of the elements used in the approach to this research have merits. By using a survey scale designed by it’s creators with the intent of providing a generalised tool, the author has attempted to use a measure that is consumption device agnostic and can be applied to different contexts. In addition, through deriving the construct of Viewing Archetypes, the process of understanding when users are viewing in different viewing contexts has been simplified. Archetypes have additionally given some fidelity to identifying viewing contexts through the documentation of specific contextual cues (Mercer, May, & Mitchell, 2014). Based on current device technology and in an environment of ubiquitous access to video, this is an approach relevant to the measurement of viewing experience. This represents a different direction in measuring UX compared to tools that consider specific devices that operate in specific contexts of use, (such as Bernhaupt & Pirker's, (2013) survey tool for iTV evaluation in the living room).

Whilst the author defends the approach taken, analysis of the UES scale suggests further development is needed to make it more suitable for measuring viewing UX across contexts. The subscale elements of Aesthetics and Novelty within the UES failed to achieve internal consistency when used to measure viewing UX in Study 2, part 1 (Chapter 5, Section 5.5.2). An inability to use the scale as a multi-dimensional tool limited the depth of analysis that could be derived from the study data. Better insights could likely have been drawn between the survey data and the observation data had the tool been more sensitive. It could be hypothesis that numerous aspects of the nature of viewing experience could have effected the scales applicability to video consumption. One possible aspect is the rich social interaction that occurs during viewing, and its contribution to viewing UX. O'Brien and Toms (2010a, p. 31) note that whilst advocating the UES as a generalised measurement tool:

> *"Social interaction may add another level of complexity and engagement to the use of technology."*

In later work on the UES other authors also found issues with the validity of using the UES as a generalised tool. In O'Brien and Toms' (2013) own review of studies using the UES they identify a number of issues. However across all the studies they describe, aesthetics emerged as a strong independent factor. This contradicts this research as aesthetics not only failed to achieve internal consistency as an independent subscale, but also failed to show a correlation with satisfaction. The lack of a relationship between aesthetics and satisfaction contradicts a number of studies in this area which link aesthetic quality with perceived usability, (Tractinsky, 1997), (Tractinsky, Katz, & Ikar, 2000) and overall user Satisfaction (Lindgaard & Dudek, 2003). It's possible video content therefore represents a different domain to interaction design in terms of user's subjective responses to questions regarding aesthetics. User scale ratings addressing aesthetics in the video domain could refer to perceptions of UI attractiveness, visual beauty of the video content, or an evaluation of the picture quality provided by the consumption device. This ambiguity is likely to confound results in this area unless specific steps are taken to account in question phrasing for these issues.

A small-scale analysis of the UES within this research suggested a modified scale with fewer factors may improve reliability and increase the UES correlation to satisfaction. Developing the scale further could be a useful and interesting exercise toward evolving a tool to measure viewing UX across contexts. An interesting approach would be to compare aesthetic measures from this tool to other subject measurement tools with a strong focus on aesthetics such as AttrakDiff 2 (Hassenzahl et al., 2003) in order to understand the relationships between the measures in terms of capturing perceptions of aesthetics in relation to viewing UX. This could possibly lead to adaptions to improve sensitivity. Based on the finding from this research, the other key elements which should be considered for extending (or developing) a scale tool to measure viewing UX are:

- Ensure the scale can capture passive experiences as well as interactive ones.
- Ensure generalisation across consumption devices and viewing contexts.
- Provide sensitivity to capture the differences between shared and solitary viewing.

8.2.2 Extending and validating the Archetypes

Within Study one, eight Archetype viewing situations were identified, (seven from the literature and Self Indulgence from the follow on field study). Due to resources, research interests and coverage of total viewing provided by the Archetypes selected, only 4 were pursued in greater detail for integration into the framework. This is a possible limitation of the framework itself, as in a real world implementation other Archetypes not yet considered by the model would simply be classified as one of the four studied. This inherently suggests a more sensitive model could be built by considering further Archetypes. An avenue of research with particular utility would be to investigate the Family Viewing Archetype. This social viewing context was common, and very closely related to social Quality Time situations. Therefore better analysis and integration of Family viewing into the framework at the Archetype level would add further fidelity to the model in a significant viewing situation for users.

A part of any such exercise to extend the framework with additional coverage of known Archetypes would also be to evaluate the model for recall and precision (Powers, 2007). In the context of this research, this would measure the systems ability to correctly and reliability characterise and differentiate the different viewing contexts. This is an outstanding action for the current model, however in order to evaluate such metrics a level of technical implementation is needed. This could be in the form of a simple stand-alone algorithm that was evaluated through a training set of data.

8.2.3 Validating the framework.

A further consideration is a user centred evaluation of the concepts developed in the research. The framework has been developed through user insights into people's experiences of consuming video in different contexts. However the outputs of the work are yet to be evaluated with users. This identifies a gap in ensuring the usefulness and user centeredness of the concepts generated.

Due to the technical and abstract nature of the framework itself, the best way to inform continued design iteration would be through a user evaluation of design scenarios. Mitchell (2005) notes that unless scenarios are representative of real user needs they can lead to services and products being developed for fictitious users. What level of personalisation and adaption would users feel comfortable with, and how do these relate to those shown in the scenarios? Bernhaupt et al. (2008) comments that users welcome greater personalisation in the living room, but a myriad of challenges surrounding trust, privacy and user acceptability exist for such systems (Briggs, Simpson, & Angeli, 2004). Therefore a user centred approach to iterating and evolving concepts in step with user needs is required. This would take the form of a traditional user centred design process (ISO, 2010) with iterative cycles of concept design, user feedback and design iteration.

If contextualised viewing user experiences are to be improved there is a need to integrate user insights and user centred design thinking into the construction of context aware technologies at the fundamental level of the technical architecture. The goal of this research has been to provide some reasoning, methods and guidance for how this might be achieved.

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10 Appendices

10.1 Appendix A: Archetypes of situated viewing.

Detailed below are the seven Archetypes of situations discovered from the literature review conducted prior to Study One in Chapter 4.

10.1.1 Archetype one: Individuals creating privacy in public places.

This Archetype identified behaviours of individuals who used consumption interactions with their mobile devices as a way to create a social barrier between themselves and others when in waiting situations in public spaces. Amongst others, this behaviour is described in Tamminen et al. (2004). It was related by the authors to their concept of temporal tensions, in such that the interaction activity with the device is used to fill unforeseen temporal gaps manifest as waiting situations in the daily plans of individuals.

This Archetype was identified from the field studies described in the following literature:

- O'Hara et al. (2007)
- Tamminen et al. (2004)
- Södergård (2003)
- Vorbau et al. (2007)
- Repo et al. (2004)
- Miyauchi et al. (2009)

This theme would appear not to exclusively relate to the consumption of video content. The behaviours identified are common characteristics of use for many mobile device interactions that are often utilised to create pseudo private "places" in public spaces. Examples include listening to music with headphones, gaming, text messaging and the use of mobile Internet. The important aspects of this situation would appear to surround the focus of the user's attention upon interactions with the device in order to shut out the outside world.

Common Inter-contextual cues identified across the situations described in the literature:

- The user experience is solitary.
- The experience occurs in a shared public space.
- The user is observable by strangers not sharing the consumption experience.
- The consumption experience is short (under half an hour).
- The user has little control over the length of the experience.
- The user utilises a handheld mobile device such as a telephone or media player.
- The user utilises previously downloaded or locally stored content.
- Opportunities for interruption of the experience are high.

10.1.2 Archetype two: Opportunist planning of content consumption.

This Archetype identifies behaviours of individuals as recounted in the literature who prepare their devices for video consumption in the expectation that an opportunity to consume content will arise in the near future. Though users are not making specific plans to consume the content at given times, they are reported as engaging in a form of loose planning so that content of interest is available when they next find themselves in a situation where they need to kill time. This form of planning is undoubtedly related to the idea of creating privacy in public spaces (as the consumption situation is extremely similar) however this Archetype is differentiated by the user's focus on maximising the utilisation of dead situations created through temporal tensions by proactively attempting to create an enjoyable video consumption experience in contrast to simply using interactions with a mobile device as a method to pass time. This suggests the user is putting greater emphasis and value upon time utilisation. Examples in the literature include O'Hara et al. (2007) who describe users who rather than spending their limited time in the home consuming video content, instead choose to time and place shift those activities into previously unused waiting situations in the mobile environment. As such, time in the home can then be freed up for more important social activities such as spending time with the family.

This Archetype was identified from the field studies described in the following literature:

- Perry et al. (2001)
- O'Hara et al. (2007)

This instance of situated use as described in the literature relates primarily to video content and often to broadcast TV content. However we can envisage similar patterns of behaviour with other content, such as users loading pod casts and books opportunistically onto their mobile devices without any clear idea of when they will get to consume it.

Common Inter-contextual cues identified across the situations described in the literature:

- The user experience is solitary.
- The experience occurs in a shared public space.

- The user is observable by strangers not sharing the consumption experience.

- The consumption experience is longer than for Archetype one. We could hypothesize this may be due to an evaluation by the user as to whether the situation duration is long enough to allow an enjoyable consumption experience in relation to the overall length of the content, though currently this is conjecture.

- The user has little control over the length of the experience but has visibility of the prospective duration.

- The user utilises a mobile device such as a telephone, media player or laptop computer.

10.1.3 Archetype three: Sharing space but not content.

This Archetype is based on the reported behaviours of family groups, who spend time in the same physical spaces as each other but who engage in different consumption activities and content choices. This is manifest in the accounts from the literature of family members carrying out other activities, (such as reading or surfing the internet) in the same room where the rest of the family are watching television. Studies such as Vorbau et al. (2007) have identified an extension to this activity through the use of mobile products as secondary consumption devices. Whilst the family watches the main television, one or more other members will watch something completely different on their mobile devices in the same physical space. This behaviour is noted as part of daily routines where the act of being located in the same room (even if engaged in different activities) is seen as part of the family social norms.

This Archetype was identified from the field studies described in the following literature:

- O'Hara et al. (2007)
- Taylor and Harper (2003)
- Vorbau et al. (2007)
- CRE (2010a)

These instances of situated use occur in the home environment and the author believes have important relationships to Taylor and Harper's (2003) concept of moral ownership of the family television to particular family members at given times of the day. Though homes now often have multiple televisions, the wish to be physically located in the same place as close family members during certain periods of the day appears a stronger influence then the need to view content of your own personal preference. In more recent times the advent of personal media players may have offered some compromise between these two factors.

Common Inter-contextual cues identified across the situations described in the literature:

- The user experience may or may not be shared, (depending upon the family member).
- The experience occurs in a shared private space.
- The user is observable by family members not sharing the consumption experience.
- The consumption experience is long (over half an hour).
- The user has control over the length of the experience.

- The users utilise both mobile devices such as a telephone, media player and laptop computers as well as the family television.

10.1.4 Archetype four: Quality Time

Archetype four is based on the observed behaviours of adults within family groups. The literature describes subsets of family groups who perceive sections of the evening as a context in which to enjoy viewing together. Often this is the time after which younger children may have gone to bed. In many families this appears to be regarded as their highest quality consumption opportunity and is reported by Taylor and Harper (2003) the time when the most engaged viewing is likely to occur.

This Archetype was identified from the field studies described in the following literature:

- Brown and Barkhuus (2006)
- Taylor and Harper (2003)
- O'Brien et al. (1999)
- CRE (2010b)

These instances of situated use occur in the home environment and (like Archetype three) also have important relationships to Taylor and Harper's (2003) concept of moral ownership of the television to particular family members at given times of the day. In the context of newer technologies it would be interesting to look at this Archetype situation in relation to the activity of time shifting. This is where users choose to record the content of most interest from other parts of the schedule so that they can be consumed within the current viewing context.

Common Inter-contextual cues identified across the situations described in the literature:

- The user experience is shared with family members.
- The experience occurs in a shared private space.
- The user is not observable by anyone not sharing the consumption experience.
- The consumption experience is long (over half an hour).
- The user has control over the length of the experience.
- The users utilise the main family television.

10.1.5 Archetype five: Family viewing

This Archetype relates to the observed behaviours described within the literature of groups engaging in viewing opportunities as a whole family for given sections of the evening. These instances of situated use involve mediation within the family group in order to find and consume content of interest to everyone. This situation is reported as involving aspects of self- censorship by adults in order to vet what content children are allowed to watch. Family viewing includes episodes of both highly engaged and more social viewing experiences. In O'Brien and Rodden (1997) the mediating act of finding content is described for many users to have evolved into weekly routines of viewing preference informed by learnt knowledge of the broadcast schedules.

This Archetype was identified from the field studies described in the following literature:

- Taylor and Harper (2003)
- O'Brien and Rodden (1997)
- Saxbe et al. (2011)

Common Inter-contextual cues identified across the situations described in the literature:

- The user experience is shared with the whole family including children.
- The experience occurs in a shared private space.
- The user is not observable by anyone not sharing the consumption experience.
- The consumption experience is long (over half an hour).
- The user has control over the length of the experience.
- The users utilise the main family television.
- The experience typical occurs in the early evening (tea time).

10.1.6 Archetype six: Creating group spaces in public places.

This Archetype is based on the behaviours of groups as observed in the literature using the sharing of content on their mobile devices, (and the social conferences surrounding them) as a way to create a shared pseudo-private space for the group in public spaces. These actions appear related to an attempt to enable some measure of privacy for the social interaction of the group. On first appraisal the emphasis within the literature regarding these instances of situated use appear focused upon the creation of social capital, with the content becoming a source for opportunities for humour and discussion.

This Archetype was identified from the field studies described in the following literature:

- O'Hara et al. (2007)
- Tamminen et al. (2004)
- Vorbau et al. (2007)
- Repo et al. (2004)

An important consideration for users within this instance of situated use appears more if the content can act as a focus for the group's discussions rather than if it is a video, a photo or a text message. Whilst users do share commercial content, within the literature (Repo et al., 2004) there is a strong focus on the kudos of discovering content that is new, surprising or difficult to find. This would suggest an investigation of the importance of sharing 3rd party user generated content (from sources such as YouTube would be an interesting proposition in relation to this Archetype). The off shoot of sharing content as a focus for social interactions within a group is the perceived creation of shared private spaces even when the interactions occur in public areas.

Common Inter-contextual cues identified across the situations described in the literature:

- The user experience is shared with friends
- The experience occurs in a shared public space.
- The user is observable by strangers not sharing the consumption experience.
- The consumption experience is short (under half an hour).
- The user has little control over the length of the experience.

- The users utilise handheld mobile devices such as a telephones and media players.
- Opportunities for interruption of the experience are high.

10.1.7 Archetype seven: Content schedules as timekeeper.

This Archetype is based on the behaviours of families as observed in the literature who use the start and end times of programs in the TV broadcast schedules to signify important timings in their daily routines. An example of this would be the end of a breakfast TV program signifying the time to leave for work. This instance of situated action is a manifestation of how engrained into daily routines the family television has become.

This Archetype was identified from the field studies described in the following literature:

- O'Brien and Rodden (1997)
- O'Brien et al. (1999)

This instance of situated use appears related to the use of the television as a companion and source of background noise. This situation relies upon traditional viewing schedules providing indirect feedback to users on the current temporal context. It would appear this situation might not be confined to video content as similar behaviours can be envisaged in relation to the use of the radio during morning routines. It could also be hypothesized that the prevalence of this situation may possibly have reduced since the original studies were carried out due to the increased frequency of time shifting and a general move away from restrictive television schedules in terms of viewing behaviours.

Common Inter-contextual cues identified across the situations described in the literature:

- The experience occurs in a shared private space.
- The user is not observable by anyone not sharing the consumption experience.
- The user has little control over the length of the experience but has visibility of the prospective duration.
- The users utilise the main family television.
- The user is described as involved in parallel tasks.
- The experience occurs at regular times of the day in response to user's daily routines.

10.1.8 Criteria for selection of Archetypes.

Detailed below is the justification for the selection of Archetypes to include within the data collection carried out in study one in Chapter 4.

Diversity in inter-contextual cues between selected Archetypes.

In order to test in further studies if inter-contextual cues for given situations of use result in differences in UX, the selected Archetypes should display variation in these elements. This requires diversity in the underlying inter-contextual cues depicted in the literature across the Archetypes selected for inclusion in the study.

An important further consideration in relation to diversity is that the Archetypes selected should specifically encompass variation in inter-contextual cues across the five areas of context proposed by Jumisko-Pyykkö and Vainio (2010). The justification for this is to ensure contrasting consumption experience models are included within the study. This will lead to the development of a more robust and realistic contextual model later in the research.

Representative of the majority of viewing.

Whilst is it difficult at this point to confirm which Archetypes represent the situations in which most viewing occurs, a recent study in the UK suggests that whilst the average number of televisions in the home has declined since 2003 in favour of mobile devices and tablets, 99% of families still watch live TV (BBC, 2013). This suggests it’s important to ensure TV viewing in the home is represented, as well as new ways of viewing on mobile devices.

Maximised applicability to real world design.

The Archetype situations selected should represent common current and emerging contexts of use. This will ensure the output of the study will have maximum applicability and commercial value across products, services and markets.

Situations accessible to study.

Archetype situations selected for inclusion need to be accessible for study by the researcher. Situations that are restrictive to study in terms of the use of observation methods, access to users, geography or devices should be considered for inclusion in terms of cost benefit to the research as a whole.

User benefits.

The study should consider the investigation of Archetype situations that are perceived by the author as currently offering sub-optimal user experiences. The justification for this is to ensure the research as a whole provides maximum impact in terms of improved design and follow on user benefits.

10.2 Appendix B: Study 1. Participant screening.

Loughborough University

You and technology.

We take your privacy seriously.
Please be assured that any information you offer will be held confidentially.
When we report the findings of this study, your identity will remain anonymous.
We will never pass your information on to a third party or use it for marketing purposes.
You are free to retire from the study at any time and request us not to use your information.

Thank you for agreeing to take part in this study. We would like to know a little bit more about you, and the technology you use for entertainment.

About you and your family

1. Your Full Name ☐

2. Your Age ☐

3. Your Sex ☐

4. Your Profession ☐

5. Number in Household ☐

About your daily routine *(mark an "x" in your selected box to show your response)*

6. Where do you work?

☐ Office ☐ Home ☐ Other ☐ I don't work

7. How do you commute to work?

☐ I Drive / Ride ☐ I get a lift ☐ Public Transport ☐ I don't commute

About your mobile technology

8. Do you own a mobile phone currently?

☐ Yes ☐ No

9. For how many years have you owned a mobile phone?
(Includes all models you have owned, not just your current one)

☐ Under 2 years ☐ Over 2 years

10. Do you routinely consume video on a mobile device (phone, media player or laptop) outside of your home?

☐ Yes ☐ No

11. Which of the below mobile phone features and services have you used in the past?
(tick all that are applicable)

Video Camera ☐ Video Player ☐
Still Camera ☐ Mobile Internet ☐
MP3 player ☐ Mobile TV ☐

Figure 10.1. Participant screening questionnaire (1/2).

About television and video in your home

12. Is watching television or video content at home part of your evening routine? ☐ Yes ☐ No

13. Do you routinely watch television at home with other family members? ☐ Yes ☐ No

14. Do you routinely watch video content sourced from the internet? (BBC iPlayer for example) ☐ Yes ☐ No

15. Which of the below digital television services do you use?
(tick all that are applicable. If you own more than one please mark a double cross "XX" next to the one you use most)

Cable (Virgin, BT vision)	☐	Sky HD	☐
Freeview	☐	TiVo	☐
Sky (standard or plus)	☐	Freesat	☐

About other technology you use

16. What other technological products do you have access to in your home?

(Mark all that are applicable).

Home PC	☐	Laptop Computer	☐
Media centre PC (TV linked)	☐	WiFi Network	☐
Broadband internet	☐	Cable Network	☐
Dial-up internet	☐	Personal Video Recorder (PVR)	☐
DVD Recorder	☐	Portable Media Player (e.g iPod Video)	☐

Thank you! Now please save and return your completed questionnaire to K.C.Mercer@lboro.ac.uk

Figure 10.2. Participant screening questionnaire (2/2).

10.2.1 Screening Criteria for Study 1

Table 10.1 lays out the criteria used to classify users into one to three user types. A maximum of three users were recruited from each group for the study.

Question	Early Adopters	Commuters	Home User
Q2	• 30-40	• 25-35	• 18-70
Q3	• Male x 2 • Female x 1	• Male x 1 • Female x 1	• Male x 1 • Female x 2
Q6	• Home / Office / Other	• Office / Other	
Q7		• Lift / Public Transport	
Q8	• Yes	• Yes	• Yes
Q9	• Over 2 years	• Over 2 years	
Q10	• Yes	• Yes	
Q11	• 4 or more items marked	• 3 or more items marked	
Q12	• Yes	• Yes	• Yes
Q14	• Yes	• Yes	
Q15	• At least 1 marked	• At least 1 marked	• At least 1 marked
Q16	• Home Computer/ BB Internet/ DVD/ Home Network (At least 2 marked)	• MP3/Home Computer/Laptop/BB Internet (At least 2 marked)	• PVR/BB Internet (both marked)

Table 10.1. Screening Criteria for Study 1.

10.3 Appendix C: Study 1. Entry interview script.

Welcome and thank you.

Brief introduction to the study.

The investigation as a whole is focused on improving people's experiences of watching video and TV across all the different situations they choose to watch. This includes at home on the TV or the PC but also outside on mobiles, media players and laptops.

This particular study is specifically looking at the places and times people choose to watch video within, and how that affects what they choose to watch.

Format of the study.

- This introduction in which we will have a short chat about you viewing.
- Leave you with a paper diary and camera, to record some of you viewing situations over the 2 weeks. (We will discuss this after our chat).
- Meet up during this time, just to observe whilst you watch as normal to get an idea see what your viewing situation is really like.
- After I have got the diary information back from you and had a look we can arrange an exit interview, where we discuss some of the things we found.

Sign the participant form.

PART A. Interview questions.

Introduction

1. **Current Favourite programmes.**

Talk me through a typical day…..

- Source for content?
- When – time shifting?
- Where – down to room / device.
- Who do you watch with?
- Do you store or keep video content / programmes?

2. **At what times of day do you watch video or TV most?**

Quality time context.

- How do you watch it?
- Where do you watch?
- Who do you watch with?
- Separate viewing or joint preferences?
- Why do you watch in those specific environments and times?

3. **Do you ever watch something different from your partner at the same time?**

Sharing space but not content.

- Separate places?
- Ever the same place but different sources – e.g. laptop one – TV other?
- Why is it only for this specific preference?

4. **Do you watch anything outside the house?**

Opportunist Planning.

- How do you watch it?
- Where do you watch it?
- What content do you watch?

5. **How did you get content on to you device?**

- Problems with doing this.
- Finding content. Sources and strategies.
- Regularity.
- Did you have a plan to watch it when you put it on?
- Do you watch different things than you do at home? – why?

6. **Any specific problems with watching outside the home?**

- Environment problems.
- Privacy or safety problems.

PART B. Introduction to the diary studies and observation

- Explanation of the paper diary.

Instructions for the camera.

- Explanation of use.
- Contact number.
- Hand over of the camera instructions.
- Hand over the information sheet.

Release for the camera.

- Explanation and release form.

Study logistical arrangements.

- Arrangements for the camera return and handover of diary info.
- Arrangements for direct observation sessions.

- 2 session one in private, one out and about or at work.
- Must be normal situations and part of your usual viewing patterns.

Finish and thank you.

10.4 Appendix D: Study 1. Data Analysis Method.

Initial descriptive statistics was generated from the diary data. This was used to categorise viewing examples into situation Archetypes based on five of the thirteen preliminary contextual cues that could be identified from diary data. These were:

- Time of day
- Viewing duration
- The device utilised
- Privacy of location
- If viewing was shared

This exercised categorised all of the diary examples into the most likely situation Archetype of the four of interest (and in cases when data deviated from the situations of interest, as other situation examples outside the scope of the study).

Where direct observation or self reported video of diary examples existed this data was reviewed to verify the situation type based on a closed coding of the other eight preliminary intercontextual cues (which could only be identified in the data from observation). This processes allowed identification and categorisation of the data into situation Archetypes.

The next stage of investigation was a context analysis of the observation and video data using an inductive open coding of any other aspects of context within the situations. This allowed rich qualitative themes from the data to be built up and contextual elements in addition to the preliminary contextual cues to be identified.

10.5 Appendix E: Study 1. Trialling of observation methods.

This section provides greater detail regarding the trial of observation methods conducted during Study 1. In reality the length of the direct observation sessions and the choice in meeting times offered by the users made these sessions no less self selecting than self-captured video. What the direct observation does appear to have offered however is a greater depth of information richness surrounding those situations where it was used.

Experimenter effects

Though the coverage of insights from the two observational methods was fairly consistent, (though self-captured video identified more situations) each captured insights in very different ways. Video observation was not able to capture the nuisances of naturalistic user behaviour. Rather than concerning themselves with the viewing experience, participants seemed more involved in creating the video clip. This finding supports some of the validity concerns around self-captured video discussed by Mark et.al. (2001). However the video observation method did prove very good at capturing the situational context and plans of the user. Therefore this data collection method actually worked very well for capturing the type of information sought in this study. Typical clips consisted of a scan of the room and social situation accompanied by a voice over of what the participants had just been doing and what they would be doing next, typically about five to ten minutes of the viewing experience itself was then captured. As such it was able to offer interesting insights on the nature of the contextual viewing situations and of particular importance, how the user perceived them.

Direct observation in contrast provided greater information on the behaviours of the user. Due to the relationship between the trial participants and the researcher, users were not overly concerned by the investigator’s presence. This method was therefore able to pick up subtle issues with distraction and note levels of user attention towards content. However the researcher was concerned by the possible impact of experimenter effects during observation in public viewing contexts. During the trial a number of users remarked on the fact that they usually have a choice in whether to consume content or not in many of the contexts observed. The fact that observation sessions were arranged by prior agreement therefore raised the possibility of users performing for the researcher in those situations when perhaps if alone they may have chosen to do something else rather than watch video. This was a key concern to the continued use of direct observation as a method to capture data during the study.

Logistics of using the observation methods

Each of the observation methods trialled had logistical benefits and challenges. The video observation method was easy to set up and required little time or effort on the part of the researcher during the data capture period. This method however did require some housekeeping activities with the cameras (recharging of the batteries and clearing of the memory cards), which did take time. Additionally as the researcher only had three cameras it meant data collection periods across users needed to be staggered to coincide with when cameras became available. Analysis of the video data required no more effort that analysing data from direct observation. However the nature of self-reporting meant the quality and quantity of data varied greatly between participants.

The direct observation method was more intensive, both in terms of time and logistics. To capture situations in the participant's natural viewing contexts meant arranging and executing observation sessions at varying times of the day, which required extreme flexibility on the part of the researcher. Sessions were also time consuming to both set up and execute. In a number of instances meetings had to be rescheduled due to changing plans on the part of the participants. Also even though sessions in the field lasted only around an hour, travelling to and from the viewing locations and executing the write up of data turned each field visit into at least a days worth of effort.

Modifications made of the data collection method

Undoubtedly direct observation methods can provide rich data, but to gain the required coverage of insight over the range of contexts seen from the video data would require a large amount of data collection and significant time spent in the field. Whilst study into the actual viewing experience may possibly call for this, the level of analysis required for context study does not exceed beyond understanding situated use.

Whilst the direct observation data captured so far will be exceptionally useful to the study, pursuing this method further needs to be balanced against the diminishing level of further insights which may be uncovered through continued use. The experience of capturing direct observation data and the coverage of insight gained leads the author to agree with Väänänen-Vainio-Mattila et al. (1998) that there are severe challenges for the researcher in collecting such data in person from natural user environments when they encompass wide variations in location and temporal contexts. On this basis the author therefore decided to build upon the direct observation data collected so far, (and which would be fully incorporated into the study findings) by augmenting those insights through the extended use of self-captured video as the sole observation method within the main data collection for Study 1.

10.6 Appendix F: Study 1. Diary data.

10.6.1 Diary Template

Week Example	(Week 1 / 2)						
Day Example	(Day 1 , 2, 3, 4, 5, 6,7)						
Time & Duration	Recorded / Live / OD	Device	Source	Video Content title	Location	Watched with	Other Comments
7.30- 8.00am	Live	Living room TV	Freeview Box - ITV	GMTV	Living room	Wife and kids	Just had it on whilst we were getting ready in the morning
1/2 hour about 6pm	Recorded	Video iPod	Downloaded video from itunes	1/2 an episode of Mitchell and Webb	Train home after work	Alone	Busy train had to watch standing up.
2 hours from about 9pm	OD	Laptop	BBC iPlayer website	Horizon, and two episodes of two pints of lager	Bedroom	Alone	

Figure 10.3. Paper diary template and introductory examples for participants.

10.6.2 Diary Data Summary

Participant	(n) examples in data	% of sample
1	42	11.5%
2	24	6.5%
3	69	19%
4	22	6%
5	32	9%
6	31	9%
7	37	10%
8	28	8%
9	26	7%
10	23	6%
11	29	8%
Total	**363**	

Privacy	(n) examples in data	% of sample
Watched in public	45	12%
Watched in private	318	88%

Socialness	(n) examples in data	% of sample
Watched alone	186	51%
Watched with others	177	49%

Time shifted	(n) examples in data	% of sample
Watched in real time	209	58%

Watched time shifted from schedules	41	11%
Watched on demand	113	31%

Time of day	**(n) examples in data**	**% of sample**
6am – 10am	29	8%
10am – 2pm	61	17%
2pm – 4:30pm	23	6%
4:30pm - 7pm	71	19.5%
7pm – 10pm	135	37%
10pm – 12:30am	28	8%
12:30am – 6am	16	4.5%

Time of week	**(n) examples in data**	**% of sample**
Weekday	268	74%
Weekend	95	26%

Consumption Device	**(n) examples in data**	**% of sample**
Main TV	223	62%
Secondary TV	26	7%
Static PC	13	4%
Laptop PC	75	19.5%
Handheld device	12	3.5%
Live / Public screen	14	4%

Table 10.2. Summary of the study one diary data.

10.7 Appendix G: Study 2, part 1. Questionnaire tool.

PARTICIPANT	
SITUATION	
DEVICE	

Please answer all questions on both sheets. This is sheet 1 of 2

Answer questions ONLY from the perspective of the session of iPlayer viewing you have just completed.

Discount any past usage to iPlayer on any other devices or in any other situation.

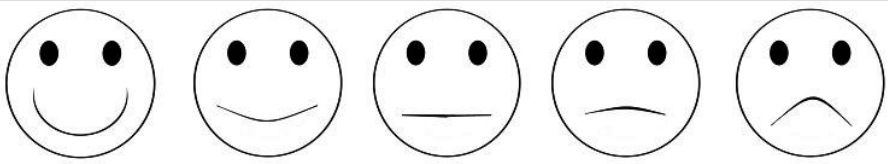
Q1 Describe what you watched and how you found it on this visit to iPlayer?

Write here:

Q2 How do you feel this visit to iPlayer went? Was it enjoyable, relaxing, fustrating, boring? Please explain why.

Write here:

Q3 Rate your overall feeling of satisfaction gained from this visit to iPlayer:



Really Great!	I'm happy	Okay I guess	I'm not happy	Really Poor!
☐	☐	☐	☐	☐

Reiversed

Now please turn the page and answer the questions overleaf. >>>

Figure 10.4. Page one of the experience questionnaire.

Circle the rating which most strongly matches your response for each of the below statements.							
		I Strongly Disagree				I Strongly Agree	
Q4	I lost myself in this video watching experience.	1	2	3	4	5	
Q5	This version of iPlayer is attractive.	1	2	3	4	5	
Q6	I felt annoyed while using this version of iPlayer.	1	2	3	4	5	
Q7	The content on this version of iPlayer incited my curiousity.	1	2	3	4	5	
Q8	I blocked out things around me whilst I was watching video.	1	2	3	4	5	
Q9	This video watching activity did not work out the way I had planne	1	2	3	4	5	
Q10	I felt in control of my video watching experience.	1	2	3	4	5	
Q11	This version of iPlayer appealed to my visual senses.	1	2	3	4	5	
Q12	I was absorbed in watching video.	1	2	3	4	5	
Q13	I felt frustrated whwn using this version of iPlayer.	1	2	3	4	5	
Q14	Using this version of iPlayer was mentally taxing.	1	2	3	4	5	
Q15	Watching video on this version of iPlayer was worthwhile.	1	2	3	4	5	
Q16	I was really drawn in to the video watching activity.	1	2	3	4	5	
Q17	This version of iPlayer is aesthetically appealing.	1	2	3	4	5	
Q18	This video watching activity was fun.	1	2	3	4	5	
Q19	When I was watching video, I lost track of the world around me.	1	2	3	4	5	
Q20	I felt discouraged whilst watching video on this version of iPlayer	1	2	3	4	5	
Q21	I would recommend watching video on this version on iPlayer.	1	2	3	4	5	
Q22	I felt involved in this video watching activity.	1	2	3	4	5	
Q23	I was so involved in watching video that I lost track of time.	1	2	3	4	5	
Q24	I continued to watch video on this version of iPlayer out of curiou	1	2	3	4	5	
Q25	I found this version of iPlayer confusing to use.	1	2	3	4	5	
Q26	This version of iPlayer was demanding.	1	2	3	4	5	
Q27	The screen layout of this version of iPlayer was visually pleasing	1	2	3	4	5	
Q28	The time I spent watching video just slipped away.	1	2	3	4	5	
Q29	I liked the graphics and images used on this version of iPlayer.	1	2	3	4	5	
Q30	I could not do some of the things I wanted to do.	1	2	3	4	5	
Q31	During the video watching I let myself go.	1	2	3	4	5	
Q32	I consider my video watching experience a success.	1	2	3	4	5	
Q33	I felt interested in my video watching activity.	1	2	3	4	5	
Q34	My video watching experience was rewarding.	1	2	3	4	5	
You have completed the survey for this veiwing session. Thank You.							

Figure 10.5. Page two of the experience questionnaire.

10.8 Appendix H: Study 2, part 1. Participant screening brief.

Contextual Study into iPlayer

Recruitment

Prepared by: Kevin Mercer

Document version: 9th JUNE 2010 (Rev 2)

Timescales

Timescale for this proposal are fixed.

Milestones	Dates
Quote proposal deadline	TBA
Final participant list	24 hours before entry sessions in each case.
Incentives delivery	5 working days before the exit sessions in each case.
Session dates	TBA

Contact Person

Kevin Mercer

Usability & Accessibility Specialist

Telephone: 07906 194375

Email: Kevin.Mercer@bbc.co.uk

Introduction

About the product

This study will attempt to provide insight into the viewing experience of consuming BBC iPlayer across a wide range of different contextual situations and end user devices. It will therefore involve research in the field as well as sessions at the BBC. The goal will be to construct a picture of the different experiences and the extent to which the features and functions of the iPlayer variants used within those contexts support optimal video consumption.

Study Format

There will be three components to this study each participant will be asked to complete:

1. An introductory group session with other participants on site at BBC broadcast centre 1 1/2hrs duration.

2. A period of one week in which the user will be asked in their own time to capture information on three specific sessions of iPlayer usage as part of their daily routines. We will ask them to capture information using a paper questionnaire and a miniature video camera that we will provide to them during the entry session.

3. A debrief group session on site at the BBC broadcast centre 2hrs duration. Users will be asked to return their information and camera at this point. The

session will then explore the user's experiences of watching iPlayer during the past week.

Recruitment Profile

40 Participants who will run in 5 groups of eight. (Note final group will run after results from groups 1 to 4 have been collated)

Group 1

Participant.	**Gender.**	**Age group.**	**User profiles**
1	Equal split of male and female across the whole sample of 40.	Following splits across the whole sample of 40 4 x 16-22 6 x 23-29 4 x 30-36 6 x 37-43 6 x 44-50 4 x 51-57 6 x 58-64 4 x 65-70	4 x Big screen + Mobile. 2 x Big screen + Desktop PC. 2 x Big screen + Laptop PC.
2			
3			
4			
5			
6			
7			
8			

See definitions in appendix for more details on user profiles.

Group 2

Participant.	**Gender.**	**Age group.**	**User profiles.**
9	Equal split of male and female across the whole sample of	Following splits across the whole sample	3 x Mobile + Nintendo Wii 2 x Big screen + Mobile 3 x Mobile + Desktop PC
10			
11			
12			

13	40.	of 40 4 x 16-22 6 x 23-29 4 x 30-36 6 x 37-43 6 x 44-50 4 x 51-57 6 x 58-64 4 x 65-70	
14			
15			
16			

See definitions in appendix for more details.

Group 3

Participant.	**Gender.**	**Age group.**	**User profiles.**
17	Equal split of male and female across the whole sample of 40.	Following splits across the whole sample of 40 4 x 16-22 6 x 23-29 4 x 30-36 6 x 37-43 6 x 44-50 4 x 51-57 6 x 58-64 4 x 65-70	4 x Sony PS3 + Mobile 2 x Sony PS3 + Desktop PC 2 x Sony PS3 + Laptop PC
18			
19			
20			
21			
22			
23			
24			

See definitions in appendix for more details.

Group 4

Participant.	**Gender.**	**Age group.**	**User profiles.**
25	Equal split of male and	Following splits across	2 x Desktop PC + Nintendo Wii 2 x Big screen + Desktop PC
26			

27	female across the whole sample of 40.	the whole sample of 40 4 x 16-22 6 x 23-29 4 x 30-36 6 x 37-43 6 x 44-50 4 x 51-57 6 x 58-64 4 x 65-70	2 x Laptop PC + Nintendo Wii 2 x Big screen + Laptop PC
28			
29			
30			
31			
32			

See definitions in appendix for more details.

Group 5

Participant.	**Gender.**	**Age group.**	**User profiles.**
33	Equal split of male and female across the whole sample of 40.	Following splits across the whole sample of 40 4 x 16-22 6 x 23-29 4 x 30-36 6 x 37-43 6 x 44-50 4 x 51-57 6 x 58-64 4 x 65-70	Profiles will be finalised after data from other groups have been analysed.
34			
35			
36			
37			
38			
39			
40			

See definitions in appendix for more details.

The following requirements also apply to all participants:

- This study will require users to record video in the places they naturally watch iPlayer. Therefore users need to be comfortable and accepting of the idea of making recordings both in private situations such as their home, and in public environments such as on the train or place of work if that is where they usually watch during the week between the two sessions. We are happy for you to tell participants the study is for the BBC/Loughborough University if this helps with recruitment.

- No BBC rejecters

- No designers

- Nobody who is involved in designing or building websites for a living

- Nobody who works in the media industry or designs for media

Research Location

- Sessions will be held in the BBC Broadcast Centre located at White City. There are no car parking facilities at the BBC, and parking locally is difficult. Participants are advised to use public transport. Nearest tube: White City station on the Central line or Wood Lane on the Hammersmith & City line.

10.8.1 Greeter

Please provide a greeter for all sessions, to assist in collecting and returning people to and from reception.

10.8.2 Quote

Please include in your quotation all costs including the supply of incentives, which we will expect you to deliver to us prior to testing in the timelines mentioned above.

If you have any questions regarding this brief please contact Kevin Mercer for clarification.

10.8.3 Appendix.

Recruitment Screener Definitions:

<u>Big screen + Mobile</u>

- User owns / accesses either: Freesat HD, Virgin media V+ box, Cello TV (internet enabled TV).

- User has watched BBC iPlayer programmes via one of the above services at least 6 times in the last 3 months and expects to watch BBC iPlayer at least two times in the week of the study from one of the above services and is happy to make a video recording of those events during the study week.

AND

- User owns a Mobile phone with 3G Internet connectivity and accesses the Internet on that device outside the home.

- User has watched BBC iPlayer via their mobile phone outside the home at least 6 times in the last 3 months and expects to watch BBC iPlayer at least two times in the week of the study from their mobile device outside the home and is happy to make a video recording of those events during the study week.

<u>Big screen + Desktop PC</u>

- User owns / accesses either: Freesat HD, Virgin media V+ box, Cello TV (internet enabled TV).

- User has watched BBC iPlayer programmes via one of the above services at least 6 times in the last 3 months and expects to watch BBC iPlayer at least two times in the week of the study from one of the above services and is happy to make a video recording of those events during the study week.

AND

- User owns / accesses a static desktop computer with Internet connectivity that may be in their home or place of work.

- User has watched BBC iPlayer via their desktop computer at least 6 times in the last 3 months and expects to watch BBC iPlayer at least two times in the week of the study from their desktop computer and is happy to make a video recording of those events during the study week.

Big screen + Laptop PC

- User owns / accesses either: Freesat HD, Virgin media V+ box, Cello TV (internet enabled TV).

- User has watched BBC iPlayer programmes via one of the above services at least 6 times in the last 3 months and expects to watch BBC iPlayer at least two times in the week of the study from one of the above services and is happy to make a video recording of those events during the study week.

AND

- User owns a laptop computer with Internet connectivity and uses it both inside and outside the home.

- User has watched BBC iPlayer via their laptop computer outside the home at least 6 times in the last 3 months and expects to watch BBC iPlayer at least two times in the week of the study from their laptop computer outside the home and is happy to make a video recording of those events during the study week.

Mobile + Nintendo Wii

- User owns a Mobile phone with 3G Internet connectivity and accesses the Internet on that device outside the home.

- User has watched BBC iPlayer via their mobile phone outside the home at least 6 times in the last 3 months and expects to watch BBC iPlayer at least two times in the week of the study from their mobile device outside the home and is happy to make a video recording of those events during the study week.

AND

- User owns / accesses a Nintendo Wii console with Internet connectivity.

- User has watched BBC iPlayer via their Nintendo Wii at least 6 times in the last 3 months and expects to watch BBC iPlayer at least two times in the week of the study from their Nintendo Wii and is happy to make a video recording of those events during the study week.

Mobile + Desktop PC

- User owns a Mobile phone with 3G Internet connectivity and accesses the Internet on that device outside the home.

- User has watched BBC iPlayer via their mobile phone outside the home at least 6 times in the last 3 months and expects to watch BBC iPlayer at least two times in the week of the study from their mobile device outside the home and is happy to make a video recording of those events during the study week.

AND

- User owns / accesses a static desktop computer with Internet connectivity that may be in their home or place of work.

- User has watched BBC iPlayer via their desktop computer at least 6 times in the last 3 months and expects to watch BBC iPlayer at least two times in the week of the study from their desktop computer and is happy to make a video recording of those events during the study week.

Sony PS3 + Mobile

- User owns / accesses a Sony Play Station 3 games console with Internet connectivity.

- User has watched BBC iPlayer via their Play Station 3 at least 6 times in the last 3 months and expects to watch BBC iPlayer at least two times in the week of the study from their Play Station 3 and is happy to make a video recording of those events during the study week.

AND

- User owns a Mobile phone with 3G Internet connectivity and accesses the Internet on that device outside the home.

- User has watched BBC iPlayer via their mobile phone outside the home at least 6 times in the last 3 months and expects to watch BBC iPlayer at least two times in the week of the study from their mobile device outside the home and is happy to make a video recording of those events during the study week.

Sony PS3 + Desktop PC

- User owns / accesses a Sony Play Station 3 games console with Internet connectivity.

- User has watched BBC iPlayer via their Play Station 3 at least 6 times in the last 3 months and expects to watch BBC iPlayer at least two times in the week of the study from their Play Station 3 and is happy to make a video recording of those events during the study week.

AND

- User owns / accesses a static desktop computer with Internet connectivity that may be in their home or place of work.

- User has watched BBC iPlayer via their desktop computer at least 6 times in the last 3 months and expects to watch BBC iPlayer at least two times in the week of the study from their desktop computer and is happy to make a video recording of those events during the study week.

<u>Sony PS3 + Laptop PC</u>

- User owns / accesses a Sony Play Station 3 games console with Internet connectivity.

- User has watched BBC iPlayer via their Play Station 3 at least 6 times in the last 3 months and expects to watch BBC iPlayer at least two times in the week of the study from their Play Station 3 and is happy to make a video recording of those events during the study week.

AND

- User owns a laptop computer with Internet connectivity and uses it both inside and outside the home.

- User has watched BBC iPlayer via their laptop computer outside the home at least 6 times in the last 3 months and expects to watch BBC iPlayer at least two times in the week of the study from their laptop computer outside the home and is happy to make a video recording of those events during the study week.

<u>Desktop PC + Nintendo Wii</u>

- User owns / accesses a static desktop computer with Internet connectivity that may be in their home or place of work.

- User has watched BBC iPlayer via their desktop computer at least 6 times in the last 3 months and expects to watch BBC iPlayer at least two times in the week of the study from their desktop computer and is happy to make a video recording of those events during the study week.

AND

- User owns / accesses a Nintendo Wii console with Internet connectivity.

- User has watched BBC iPlayer via their Nintendo Wii at least 6 times in the last 3 months and expects to watch BBC iPlayer at least two times in the week of the study from their Nintendo Wii and is happy to make a video recording of those events during the study week.

<u>Big screen + Desktop PC</u>

- User owns / accesses either: Freesat HD, Virgin media V+ box, Cello TV (internet enabled TV).

- User has watched BBC iPlayer programmes via one of the above services at least 6 times in the last 3 months and expects to watch BBC iPlayer at least two times in the week of the study from one of the above services and is happy to make a video recording of those events during the study week.

AND

- User owns / accesses a static desktop computer with Internet connectivity that may be in their home or place of work.

- User has watched BBC iPlayer via their desktop computer at least 6 times in the last 3 months and expects to watch BBC iPlayer at least two times in the week of the study from their desktop computer and is happy to make a video recording of those events during the study week.

Laptop PC + Nintendo Wii

- User owns a laptop computer with Internet connectivity and uses it both inside and outside the home.

- User has watched BBC iPlayer via their laptop computer outside the home at least 6 times in the last 3 months and expects to watch BBC iPlayer at least two times in the week of the study from their laptop computer outside the home and is happy to make a video recording of those events during the study week.

AND

- User owns / accesses a Nintendo Wii console with Internet connectivity.

- User has watched BBC iPlayer via their Nintendo Wii at least 6 times in the last 3 months and expects to watch BBC iPlayer at least two times in the week of the study from their Nintendo Wii and is happy to make a video recording of those events during the study week.

Big screen + Laptop PC

- User owns / accesses either: Freesat HD, Virgin media V+ box, Cello TV (internet enabled TV).

- User has watched BBC iPlayer programmes via one of the above services at least 6 times in the last 3 months and expects to watch BBC iPlayer at least two times in the week of the study from one of the above services and is happy to make a video recording of those events during the study week.

AND

- User owns a laptop computer with Internet connectivity and uses it both inside and outside the home.

- User has watched BBC iPlayer via their laptop computer outside the home at least 6 times in the last 3 months and expects to watch BBC iPlayer at least two times in the week of the study from their laptop computer outside the home and is happy to make a video recording of those events during the study week.

10.9 Appendix I: Study 2, part 1. Camera equipment.

World's Smallest DV Camera

The new super-tiny Muvi Micro DV Cam is the smallest DV camera in the world. This ultra-portable digital video device measures no more than 5.5 x 2 x 1.6 cm (2 x 0.8 x 0.4 inches).

You can pop it in your top pocket, switch it on to sound activated record and not only will it be discreet, it won't start recording until it hears over 65 decibels of noise. As soon as it goes quiet for longer than 2 minutes it will save the movie file and switch off again to save power. The integrated clip on the side of the camera means you can hook it on the side of just about everything.

The camera records at 2 megapixels, which is quite impressive for something this small and the resolution is 640 x 480 at 30 frames per second all of which is saved to micro SD card. The battery can be charged via any USB socket and will give you a decent 2-3 hours recording time.

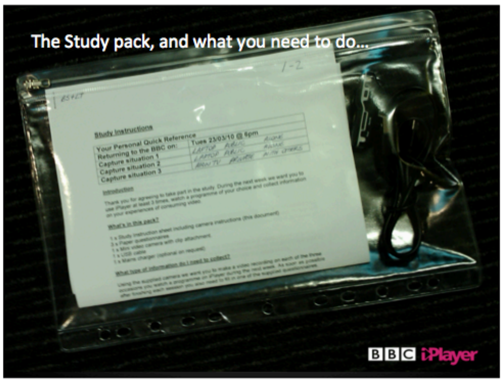
Features

- The smallest DV camera in the world.
- The 2MP lens records in 640 x 480 at 30 frames per second.

- Built-in mic allows you to record sound and use voice-activated record.
- Records to Micro SD card (2GB included – can be upgraded up to 8GB).
- 1GB of memory can record up to 1 hour of footage – so 2GB will record 2 hours.
- Requires a USB socket for charging (cable included).
- Compatible with Windows and Mac.
- Powered by rechargeable Lithium Ion Battery (included).
- Suitable for ages 14 years +.
- Size: 5.5 x 2 x 1.6cm.

10.10 Appendix J: Study 2, part 1. Session Stimulus.

10.10.1 Entry Session Stimulus



The "digital" spy who loved me

1. Start the camera.
2. Watch iPlayer, in the viewing situation.
3. Stop the camera.
4. Fill in the questionnaire.
5. Charge the camera before next use.

BBC iPlayer

Next time we meet..

Next Wednesday 24th March at 6pm
(Try and be 10 minutes early so we can start on time)

Don't forget to bring back your filled in pack and camera!

BBC iPlayer

Any problems, or questions.....

Call Kevin : 07906 194375

BBC iPlayer

10.10.2 Exit Session Stimulus

10.11 Appendix K: Study 2, part 1. UES questionnaire analysis.

10.11.1 Reliability

Internal Consistency.

An analysis of the internal reliability of the UES questionnaire tool subscales was conducted as part of the Study 2, part 1 data analysis. A scale is typically considered reliable at values for Cronbach's alpha above 0.7. Table 10.3 provides the values for Cronbach's alpha, mean and standard deviation.

Indexes	No. Items	Cronbach's Alpha	Mean	Standard Deviation
All indexes (Overall UES)	31	0.95	2.96	0.48
Novelty (NO)	3	0.42	2.97	0.83
Perceived Usability (PU)	8	0.84	3.25	0.70
Aesthetics (AE)	5	0.57	2.29	0.63
Endurability (EN)	5	0.70	3.06	0.61
Felt Involvement (FI)	3	0.74	3.11	0.59
Focused Attention (FA)	7	0.79	2.97	0.50

Table 10.3. Reliability analysis and descriptive statistics for UES subscales.

PU, EN & FI all demonstrated acceptable values for Cronbach's Alpha with levels of 0.7 and above. Both AE and NO did not reach acceptable levels for internal consistency and this could not be improved towards 0.7 through eliminating items from the subscale. Means for the data were calculated by summing individual ratings from a user in a given subset, and then dividing by the total number of items in that subscale. These individual scores were then used to obtain means and standard deviations for the whole subscale. Mean values for PU, EN, FI and NO were appropriate for a 5 point Likert scale (around the mid-point of 3). However the average rating for Aesthetics *(M=2.29, SD=0.63)* was low.

Correlations were calculated amongst the UES sub-scales using Pearson's *R*, (see Table 10.4). Significant correlations were observed between most subscales. Low to moderate correlation values (below 0.5) suggest that subscales are measuring distinct factors. However values above 0.5 (such as between NO-PU, NO-AE, NO-EN, NO-FA, PU-EN, PU-FA, EN-FA) suggest there may be questions within those scales that load onto more than one of the subscales.

Indexes	**Novelty (NO)**	**(PU)**	**(AE)**	**(EN)**	**(FI)**
Perceived Usability (PU)	0.68*				
Aesthetics (AE)	0.57*	0.34*			
Endurability (EN)	0.51*	0.64*	0.19		
Felt Involvement (FI)	0.45*	0.33*	0.34*	0.36*	
Focused Attention (FA)	0.53*	0.56*	0.38*	0.51*	0.57
*$p < 0.001$					

Table 10.4. Inter-correlations of UES subscales.

Factor analysis

Factor analysis was carried out to investigate the underlying factors being measured within the survey. A scree plot (Figure 10.6) was created using eigenvalues calculated from the correlation matrix in Table 10.4. A visual inspection of the chart suggested only 3 or 4 factors rather than the 6 proposed in the survey.

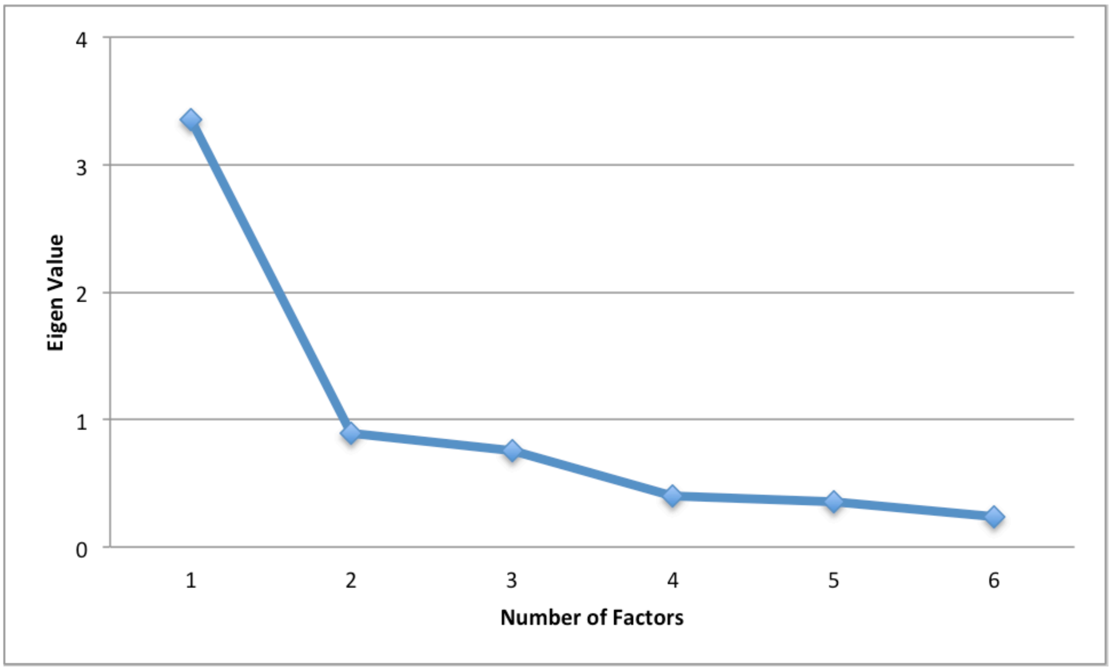


Figure 10.6. Scree plot of Eigenvalues suggests a 3 or 4 factor design.

Factor extraction showed 3 factors could account for 83.4% of the variance (Table 10.5). A reduced model of the loading factors based on eigenvectors suggested low discrimination by subscale items and high overlap of loading across factors, with three of the five subscales contributing to more than one factor at levels over 0.4 (Table 10.6).

Factor	**Eigen Value**	**% Variance**	**Cumulative % Variance**
1	3.356	55.94	55.94
2	0.893	14.89	70.84
3	0.754	12.58	83.41
4	0.397	6.63	90.04
5	0.358	5.98	96.03
6	0.238	3.97	100

Table 10.5. Factor extraction showed only 3 factors could account for over 80% of the variance.

Indexes	Factor 1	Factor 2	Factor 3	Commu -nalities	Specific Variance
Perceived Usability (PU)	**0.812**	0.312	0.282	0.837	0.162
Aesthetics (AE)	**0.605**	**-0.674**	0.303	0.914	0.086
Endurability (EN)	**0.727**	**0.526**	0.039	0.808	0.191
Felt Involvement (FI)	**0.667**	-0.217	**-0.637**	0.898	0.101
Focused Attention (FA)	**0.799**	0.027	-0.313	0.738	0.261
Values above 0.4 represent significant loading				5.004	0.995

Table 10.6. Reduced model of loading factors, (3 factor design).

This analysis points to the conclusion that in the context of measuring viewing experience the UES does not achieve high discrimination of sub scale factors, and as such the data should only to interpreted reliably as a uni-dimensional scale.

10.11.2 Correlations to Satisfaction and overall UES.

Correlations were calculated amongst the UES sub-scale items to Satisfaction using Spearman's R (as satisfaction responses were not normally distributed). See Table 10.7 for a summary.

Indexes	Satisfaction
Perceived Usability (PU)	0.69*
Aesthetics (AE)	0.13
Endurability (EN)	0.59*
Felt Involvement (FI)	0.21*
Focused Attention (FA)	0.38*
Novelty (NO)	0.49*
*$p < 0.01$	

Table 10.7. Inter-correlations of UES subscales to Satisfaction.

Correlations were calculated amongst the UES sub-scale to overall UES using Person' s R (as UES responses were normally distributed). See Table 10.8.

Indexes	UES
Perceived Usability (PU)	0.87*
Aesthetics (AE)	0.60*
Endurability (EN)	0.74*
Felt Involvement (FI)	0.60*
Focused Attention (FA)	0.79*
Novelty (NO)	0.83*
*$p < 0.01$	

Table 10.8. Inter-correlations of UES subscales to Overall UES.

10.12 Appendix L: Study 2, part 2. Video Coding Protocol.

The first scheme captured user activity and interaction with the consumption device. The goal was to understand if device interaction behaviour during the session, (such as time spent playing video, finding something to watch, or adjusting settings) was associated with differences in ratings of the experience. In addition where needed this scheme captured screen activity to understand occasions when the device was not capable of providing video successfully, (e.g. buffering content, error messages or broken connections). These scenarios introduced the coding item "waiting for content". The full details for this schema are noted in Table 10.9.

Coding	Item description
DA0	Device is not in use.
DA1	Device is in use for non-video purposes.
DA2	User is preparing device to play video.
DA3	User is searching for video content to play.
DA4	User is waiting for content. (buffering or errors).
DA5	User is controlling the content, (video is not playing).
DA6	User is controlling the content, (video is playing).
DA7	Video content is playing in a window.
DA8	Video content is playing full screen.

Table 10.9. Overview of coding scheme for device interaction.

The second schema addressed engagement with media through measurement of exposure to other environmental distractions during consumption. This coding sought to investigate the levels of attentiveness given to the content as attention "noise" in the environment varied. In this case the goal was therefore to assess whether differences in environmental distraction within sessions could be associated to differences in rating. The coding scheme followed Holmes & Bloxham's (2007) levels of engagement through media exposure. The coding items are noted in Table 10.10.

Coding	Item description
ME0	Video not present
ME1	Device video is a secondary media source amongst competing media sources and media consumption is a secondary user activity.
ME2	Device video is a secondary media source amongst competing media sources but media consumption is the only user activity.
ME3	Device video is the primary media source amongst competing media sources and media consumption is a secondary user activity.
ME4	Device video is the primary media source amongst competing media sources but media consumption is the only user activity.
ME5	Device video is the only media source but media consumption is a secondary user activity.
ME6	Device video is the only media source and media consumption is the only user activity.

Table 10.10. Overview of coding scheme for media exposure (adapted from Holmes & Bloxham 2007).

The third scheme captured interpersonal interactions. Lull (1990) showed television viewing plays a powerful central role in the construction and maintenance of interpersonal relationships. Of interest in this context was if the nature and focus of discussion between users in the viewing environment was associated with changes in the rating of the experience. This schema aimed to capture the focus of all verbal utterances, both between users and also those gasps, groans and laughter directed directly at the content (Phatics). Oehlberg et al. (2006), developed a typology of conversational themes around television viewing and this provides particularly relevant itemisation. However developing on Oehlberg's et al. work it additionally seemed important to capture it the user providing the rating is actually engaged in conversation, or if it is the other actors in the viewing environment doing the talking. The additional introduction of a no verbalisation code ensures the scheme was exhaustive. The coding details for this paradigm are noted in Table 10.11.

Coding	Item description
II0	No Verbalisation
II1	User Phatic ("Whoa!", laughter, gasps, groans).
II2	Other Actor Phatic
II3	User Content-Based ("Daleks! I love Doctor Who!")
II4	Other Actor Content-Based
II5	User Context-Based ("I heard Matt Smith is in a new play")
II6	Other Actor Context-Based
II7	User Logistical ("Can you turn up the volume?")
II8	Other Actor Logistical
II9	User Non-Sequitur ("Are you working tomorrow?")
II10	Other Actor Non-Sequitur

Table 10.11. Overview of coding scheme for interpersonal interactions, (Adapted from Oehlberg et al., 2006).

The fourth and final schema captured the users physical context, with particular focus on local and micro mobility as defined by Weilenmann (2003). Of interest here was if the user's ability to comfortably relax or the need to shift positions in the local environment during the experience, (such as changing trains or moving around the kitchen) was associated with changes in the rating of the experience. An additional consideration was if aspects of micro-mobility such as the need to hold the viewing device also had associations to ratings. The coding details for this paradigm are noted in Table 10.12.

Coding	Item description
PC0	User is walking
PC1	User is standing up
PC2	User is sitting down, (upright)
PC3	User is sitting down, (lean back)
PC4	User is lying down
PC5	User is walking – holding device
PC6	User is standing up – holding device
PC7	User is sitting down, (upright) – holding device
PC8	User is sitting down, (lean back) – holding device
PC9	User is lying down – holding device

Table 10.12. Overview of coding scheme for local and macro mobility.

10.13 Appendix M: Study 2, part 2. Descriptive Statistics.

This section depicts summary data from all sessions selected for analysis. This has been organised by coded area and includes full data on frequency of responses, average length of episode per coded instance, and average total duration of all the summed code instances per a given session.

Device Activity

Frequency

Code	*Freq Pos*	*Expected Pos*	*Freq Neg*	*Expected Neg*	*X2*	*P*
DA0	13	9.81	5	8.18	2.267	0.132
DA1	6	7.09	7	5.9	0.370	0.543
DA2	17	19.09	18	15.91	0.505	0.477
DA3	12	16.36	18	13.63	13.63	0.109
DA4	30	30.1	25	24.9	0	0.999
DA5	26	28.36	26	23.63	0.434	0.51
DA6	17	13.63	8	11.63	1.824	0.176
DA7	17	14.18	9	11.82	1.231	0.267
DA8	32	24.54	13	20.45	4.978	**0.025***

*Table 10.13. Chi-squared analysis of variation in frequency responses for Device activity codes, positive versus negatively rated sessions. 1 degree of freedom, two tailed probably, *significance >=0.05.*

Average Duration Per Code

Indexes	Mean	Med	SD	Skew	Kurtosis	Test for normality	
						Shapiro-Wilk W	*p*
DA0 -VE	*60.2 (5)*	*24*	*70.01*	*0.8*	2.05	0.826	*0.13*
DA0 +VE	*56.23 (13)*	*21*	*112.35*	*2.95*	10.16	0.478	***<0.001****
DA1 -VE	*24.14 (7)*	*16*	*29.15*	*1.87*	4.82	0.643	***<0.001****
DA1 +VE	*47.83 (6)*	*21*	*74.42*	*1.69*	4.03	0.64	*0.002*
DA2 -VE	*59.77 (18)*	*12.5*	*129.41*	*2.89*	10.48	0.497	***0****
DA2 +VE	*33.17 (17)*	*21*	*24.50*	*1.1*	3.31	0.87	*0.022*
DA3 -VE	*44.77 (18)*	*24.5*	*51.11*	*1.74*	5.18	0.753	***<0.001****
DA3 +VE	*31.75 (12)*	*20*	*25.48*	*1.19*	3.47	0.838	*0.026*
DA4 -VE	*13.88 (25)*	*6*	*18.38*	*1.91*	5.92	0.71	***<0.001****
DA4 +VE	*6.46 (30)*	*5.5*	*5.65*	*1.78*	6.92	0.822	***<0.001****
DA5 -VE	*2.92 (26)*	*2*	*4.51*	*3.39*	14.06	0.458	***0****
DA5 +VE	*6.42 (26)*	*2*	*11.81*	*3.16*	13.19	0.514	***0****
DA6 -VE	*3.62 (8)*	*1.5*	*5.5*	*2.12*	5.73	0.556	***<0.001****
DA6 +VE	*6.58 (17)*	*3*	*8.27*	*2.07*	7.10	0.705	***<0.001****
DA7 -VE	*311.22 (9)*	*48*	*419.67*	*1.06*	2.53	0.759	*0.006*
DA7 +VE	*391.11 (17)*	*6*	*748.08*	*1.98*	5.79	0.608	***<0.001****
DA8 -VE	*745 (13)*	*670*	*626.43*	*0.19*	1.59	0.908	*0.174*
DA8 +VE	1037.59 (32)	*779*	*1158.51*	*1.01*	2.98	0.831	***<0.001****

*Table 10.14. Descriptive Statistics for Device Activity. Average duration of codes instance. *Significance of 0.001, reject sample data as being drawn from normal distribution.*

Code	Test statistic	Test statistic value	Mean Rank (Positive Sessions)	Mean Rank (Negative Sessions)	*(Df)*	*p*
DA0	U	35.5	*123.5*	*47.5*		0.767
DA1	U	24.5	*42*	*49*		0.617
DA2	U	206.5	*306*	*324*		0.077
DA3	U	103	*186*	*279*		0.823
DA4	U	433	*840*	*700*		0.326
DA5	U	393.5	*689*	*689*		0.309
DA6	U	49	*221*	*104*		0.268
DA7	U	96.5	*229.5*	*121.5*		0.281
DA8	U	204	*736*	*299*		0.92

*Table 10.15. Device Activity average duration of codes per instance. Test for differences in average duration of codes in positively rated sessions versus negatively rated. *Significance of 0.05.*

Average Duration Summed By Session.

Indexes	Mean	Med	SD	Skew	Kurtosis	Test for normality	
						Shapiro-Wilk W	*p*
DA0 -VE	*75.25 (4)*	16	124.06	1.14	2.32	0.674	*0.005*
DA0 +VE	*81.22 (9)*	25	161.93	2.45	7.05	0.453	***0****
DA1 -VE	*28.16 (6)*	17.5	29.96	1.74	4.12	0.596	***<0.001****
DA1 +VE	*71.75 (4)*	36.5	86.43	1.08	2.27	0.761	*0.049*
DA2 -VE	*153.71 (7)*	55	195.95	1.09	2.70	0.788	*0.031*
DA2 +VE	*43.38 (13)*	21	43.21	1.62	4.77	0.754	*0.002*
DA3 -VE	*62 (13)*	32	63.13	1.06	2.89	0.813	*0.009*
DA3 +VE	*57.25 (12)*	24	82.45	2.49	8.13	0.605	***<0.001****
DA4 -VE	*26.92 (13)*	14	27.86	0.88	2.21	0.8	*0.007*
DA4 +VE	*12 (16)*	10	7.78	1.05	3.82	0.919	*0.167*
DA5 -VE	*6.33 (12)*	2	9.8	2.31	7.32	0.604	***<0.001****
DA5 +VE	*12.14 (14)*	5.5	15.54	1.85	5.54	0.711	***<0.001****
DA6 -VE	*5.8 (5)*	3	6.53	1.21	2.83	0.787	*0.064*
DA6 +VE	*10.18 (11)*	9	9.28	1.52	5.02	0.823	*0.018*
DA7 -VE	*400.14 (7)*	72	555.26	0.88	1.93	0.738	*0.009*
DA7 +VE	949.14(7)	29	1197.27	0.42	1.33	0.753	*0.014*
DA8 -VE	*1383.57 (7)*	1367	317.48	-0.39	1.97	0.923	*0.499*
DA8 +VE	2075.18 (16)	1819	1179.67	0.04	1.98	0.942	*0.381*

*Table 10.16. Descriptive Statistics for Device Activity. Average duration of codes when summed by session. *Significance of 0.001, reject data as being drawn from normal distribution.*

Code	**Test statistic**	**Test statistic value**	**Mean Rank (Positive Sessions)**	**Mean Rank (Negative Sessions)**	***(Df)***	***p***
DA0	-					
DA1	-					
DA2	t	1.98			*18*	0.062
DA3	U	73	*156*	*169*		0.867
DA4	t	2.05			*27*	**0.049***
DA5	U	51	*189*	*162*		0.089
DA6	t	0.94			*14*	0.36
DA7	t	1.1			*12*	0.292
DA8	t	1.59			*21*	0.146

*Table 10.17. Device Activity average duration of codes when summed by session. Test for differences in average duration of codes in positively rated sessions versus negatively rated. *Significance of 0.05.*

Media Engagement

Frequency

Code	***Freq Pos***	***Expected Pos***	***Freq Neg***	***Expected Neg***	***X2***	***P***
ME0	20	22.91	22	19.09	0.814	0.367
ME1	0	-	0	-	N/A	
ME2	0	-	2	-	N/A	
ME3	0	-	0	-	N/A	
ME4	4	-	1	-	N/A	
ME5	15	12.01	7	9.99	1.649	0.199
ME6	32	23.45	11	19.54	6.847	**0.008***

*Table 10.18. Chi-squared analysis of variation in frequency responses for Media Engagement codes, positive versus negatively rated sessions. 1 degree of freedom, two tailed probably, *significance >=0.05.*

Average Duration Per Code

Indexes	Mean	Med	SD	Skew	Kurtosis	Test for normality	
						Shapiro-Wilk W	*p*
ME0 -VE	162.6(23)	92	243.08	2.52	9.46	0.667	**>0.001***
ME0 +VE	98.35(20)	41.5	124.24	1.6	4.15	0.702	**>0.001***
ME1 -VE	-						
ME1 +VE	-						
ME2 -VE	1168(2)	1168	90.5	0	1	1	1
ME2 +VE	-						
ME3 -VE	-						
ME3 +VE	-						
ME4 -VE	290(1)	290	-	-	-	1	1
ME4 +VE	1584.5(4)	1524	1488.65	0.03	1.08	0.839	0.193
ME5 -VE	350.42(7)	88	451.05	0.77	1.82	0.778	0.024
ME5 +VE	363.53(15)	57	768.28	2.12	5.63	0.506	**0***
ME6 -VE	685.18(11)	562	545.24	0.66	2.37	0.929	0.41
ME6 +VE	903.84(32)	326	1110.02	1.36	3.84	0.772	**>0.001***

*Table 10.19. Descriptive Statistics for Media Engagement. Average duration of codes instance. *Significance of 0.001, reject sample data as being drawn from normal distribution.*

Code	Test statistic	Test statistic value	Mean Rank (Positive Sessions)	Mean Rank (Negative Sessions)	*(Df)*	*p*
ME0	U	212	*440*	*506*		0.661
ME1	-					
ME2	-					
ME3	-					
ME4	-					
ME5	U	57	*172.5*	*80.5*		0.75
ME6	U	188	*704*	*242*		0.73

*Table 10.20. Media Engagement average duration of codes per instance. Test for differences in average duration of codes in positively rated sessions versus negatively rated. *Significance of 0.05.*

Average Duration Summed By Session.

Indexes	Mean	Med	SD	Skew	Kurtosis	Test for normality	
						Shapiro-Wilk W	*p*
ME0 -VE	206(13)	*172*	148.68	0.86	2.84	0.922	*0.268*
ME0 +VE	120.4(15)	*59*	139.36	1.21	2.92	0.753	**>0.001***
ME1 -VE	-						
ME1 +VE	-						
ME2 -VE	1168(2)	*1168*	90.5	0	1	1	*1*
ME2 +VE	-						
ME3 -VE	-						
ME3 +VE	-						
ME4 -VE	290(1)	*290*	-	-	-	1	*1*
ME4 +VE	2112.66(3)	*2622*	1723.40	-0.49	1.5	0.934	0.505
ME5 -VE	490.6(5)	*88*	618.37	0.44	1.27	0.768	0.043
ME5 +VE	1090.6(5)	*706*	1079	0.29	1.25	0.833	*0.148*
ME6 -VE	1256.16(6)	*1399*	547.62	-0.83	2.41	0.902	*0.389*
ME6 +VE	1807.68(16)	*1718.5*	1217.25	0.17	1.94	0.936	*0.309*

*Table 10.21. Descriptive Statistics for Media Engagement. Average duration of codes when summed by session. *Significance of 0.001, reject data as being drawn from normal distribution.*

Code	Test statistic	Test statistic value	Mean Rank (Positive Sessions)	Mean Rank (Negative Sessions)	*(Df)*	*p*
ME0	U	141	*217.5*	*188.5*		**0.045 ***
ME1	-					
ME2	-					
ME3	-					
ME4	-					
ME5	t	1.078			*8*	0.312
ME6	t	1.057			*20*	0.302

*Table 10.22. Media Engagement average duration of codes when summed by session Test for differences in average duration of codes in positively rated sessions versus negatively rated. *Significance of 0.05.*

Interpersonal Interactions

Frequency

Code	*Freq Pos*	*Expected Pos*	*Freq Neg*	*Expected Neg*	*X2*	*P*
II0	168	146.19	100	*121.81*	*7.156*	**0.007***
II1	33	19.63	3	*16.36*	*N/A*	
II2	12	11.45	9	*9.54*	*0.057*	0.811
II3	29	21.82	11	*18.18*	*5.198*	**0.022***
II4	14		1		*N/A*	
II5	15	12.01	7	*9.99*	*1.649*	0.199
II6	10	8.72	6	*7.27*	*0.408*	0.523
II7	15	30	40	*25*	*16.506*	**>0.001***
II8	4		16		*N/A*	
II9	30	35.45	35	*29.54*	*1.848*	0.174
II10	52	43.64	28	*36.36*	*3.524*	0.06

*Table 10.23. Chi-squared analysis of variation in frequency responses for Interpersonal Interaction codes, positive versus negatively rated sessions. 1 degree of freedom, two tailed probably, *significance >=0.05.*

Average Duration Per Code

Indexes	Mean	Med	SD	Skew	Kurtosis	Test for normality	
						Shapiro-Wilk W	*p*
II0 -VE	139.4(98)	*21.5*	341.26	3.43	14.33	0.431	**>0.001***
II0 +VE	186.5(116)	*35.5*	501.3	5.14	32.33	0.373	**>0.001***
II1 -VE	4.33(3)	*3*	3.21	0.63	1.5	0.871	*0.298*
II1 +VE	2.6(25)	*2*	1.68	2.36	9.46	0.708	**>0.001***
II2 -VE	7.33(9)	*7*	4.24	0.16	1.81	0.947	*0.657*
II2 +VE	4.33(9)	*4*	1.73	0.22	1.64	0.921	*0.398*
II3 -VE	7.5(10)	*4*	10.25	2.44	7.4	0.555	**>0.001***
II3 +VE	3.27(11)	*3*	1.84	1.67	4.91	0.737	*0.002*
II4 -VE	10(1)	*10*	-	-	-	1	*1*
II4 +VE	3.5(10)	*3.5*	1.58	0	1.98	0.966	0.848
II5 -VE	5.14(7)	*4*	5.84	1.79	4.64	0.677	0.002
II5 +VE	6.36(11)	*5*	6.23	2.25	7.13	0.658	**>0.001***
II6 -VE	9.67(6)	*3*	16.87	1.76	4.15	0.57	**>0.001***
II6 +VE	11.5(10)	*7*	14.86	2.08	6.23	0.666	**>0.001***
II7 -VE	9.56(39)	*4*	12.54	2.29	7.38	0.627	**0***
II7 +VE	3.28(7)	*3*	2.14	1.81	4.67	0.638	**>0.001***
II8 -VE	4.8(15)	*4*	2.51	0.57	2.44	0.939	0.371
II8 +VE	2(1)	*2*	-	-	-	1	**1**
II9 -VE	12.6(35)	*4*	31.32	4.18	20.09	0.365	**>0.001***
II9 +VE	4.71(17)	*4*	4.56	2.84	10.86	0.619	**>0.001***
II10 -VE	11.96(25)	*5*	15.92	2.5	9.69	0.659	**0***
II10 +VE	28.47(51)	*9*	61.49	3.47	13.81	0.421	**>0.001***

*Table 10.24. Descriptive Statistics for Interpersonal Interaction. Average duration of codes instance. *Significance of 0.001, reject sample data as being drawn from normal distribution.*

Code	**Test statistic**	**Test statistic value**	**Mean Rank (Positive Sessions)**	**Mean Rank (Negative Sessions)**	***(Df)***	***p***
II0	U	4949.5	*12.47*	*10.53*		0.103
II1	-					
II2	t	1.963			*16*	0.067
II3	U	75	*121*	*110*		0.159
II4	-					
II5	U	27.5	*104.5*	*66.5*		0.319
II6	U	21	*85*	*51*		0.329
II7	U	74.5	*164.5*	*916.5*		0.057
II8	-					
II9	U	272.5	*450.5*	*927.5*		0.625
II10	U	468.5	*1963.5*	*962.5*		0.054

*Table 10.25. Interpersonal Interaction average duration of codes per instance. Test for differences in average duration of codes in positively rated sessions versus negatively rated. *Significance of 0.05.*

Average Duration Summed By Session.

Indexes	Mean	Med	SD	Skew	Kurtosis	Test for normality	
						Shapiro-Wilk W	*p*
II0 -VE	986.64(14)	*1115.5*	647.41	-0.12	1.63	0.895	*0.095*
II0 +VE	2239(18)	*2156.5*	1130.99	-0.15	2.44	0.969	*0.796*
II1 -VE	4.33(3)	*3*	3.21	0.63	1.5	0.871	*0.298*
II1 +VE	8.88(9)	*4*	15.67	2.32	6.68	0.542	**>0.001***
II2 -VE	81(1)	*81*	-	-	-	1	*1*
II2 +VE	7(4)	*2*	10.67	1.15	2.32	0.668	*0.004*
II3 -VE	20.75(4)	*20*	20.61	0.02	1.04	0.809	*0.121*
II3 +VE	14.5(8)	*11.5*	9.93	0.63	1.86	0.862	*0.124*
II4 -VE	10(1)	*10*	-	-	-	1	*1*
II4 +VE	14.67(3)	*9*	10.69	0.7	1.5	0.789	0.089
II5 -VE	18(2)	*18*	21.21	0	1	1	1
II5 +VE	17.2(5)	*8*	22.19	1.34	3.01	0.728	*0.018*
II6 -VE	29(2)	*29*	36.76	0	1	1	*1*
II6 +VE	37.67(3)	*23*	43.87	0.54	1.5	0.916	*0.439*
II7 -VE	94.75(4)	*52*	121.67	0.94	2.14	0.834	*0.179*
II7 +VE	16.33(6)	*11.5*	15.87	10.4	2.79	0.872	*0.235*
II8 -VE	26(3)	*5*	39.88	0.69	1.5	0.792	*0.095*
II8 +VE	6(3)	*2*	6.92	0.7	1.5	0.75	***0****
II9 -VE	63(7)	*31*	93.44	1.74	4.5	0.692	*0.003*
II9 +VE	28.37(8)	*17.5*	30.26	0.75	2.07	0.854	*0.106*
II10 -VE	99.66(3)	*83*	82.27	0.35	1.5	0.969	*0.663*
II10 +VE	185.62(8)	*24.5*	341.45	1.97	5.36	0.612	**>0.001***

*Table 10.26. Descriptive Statistics for Interpersonal Interaction. Average duration of codes when summed by session. *Significance of 0.001, reject data as being drawn from normal distribution.*

Code	**Test statistic**	**Test statistic value**	**Mean Rank (Positive Sessions)**	**Mean Rank (Negative Sessions)**	***(Df)***	***p***
II0	t	3.69			*30*	**>0.001***
II1	-					
II2	-					
II3	-					
II4	-					
II5	-					
II6	-					
II7	-					
II8	-					
II9	t	0.994			*13*	0.338
II10	-					

*Table 10.27. Interpersonal Interaction. Average duration of codes when summed by session Test for differences in average duration of codes in positively rated sessions versus negatively rated. *Significance of 0.05.*

Personal Context

Frequency

Code	*Freq Pos*	*Expected Pos*	*Freq Neg*	*Expected Neg*	*X2*	*P*
PC0	3		5		*N/A*	
PC1	1		8		*N/A*	
PC2	11	14.18	15	*11.82*	*1.572*	0.21
PC3	8		4		*N/A*	
PC4	2		1		*N/A*	
PC5	2		0		*N/A*	
PC6	2		2		*N/A*	
PC7	7		1		*N/A*	
PC8	1		1		*N/A*	
PC9	0		3		*N/A*	

*Table 10.28. Chi-squared analysis of variation in frequency responses for Personal Context codes, positive versus negatively rated sessions. 1 degree of freedom, two tailed probably, *significance >=0.05.*

Average Duration Per Code

Indexes	Mean	Med	SD	Skew	Kurtosis	Test for normality	
						Shapiro-Wilk W	*p*
PC0 -VE	90.6(5)	*21*	102.51	0.41	1.2	0.753	*0.0321*
PC0 +VE	190.67(3)	*88*	200.76	0.69	1.5	0.803	*0.123*
PC1 -VE	79.75(8)	*49.5*	100.73	1.41	3.9	0.786	*0.021*
PC1 +VE	13(1)	*13*	-	-	-	1	*1*
PC2 -VE	281.46(15)	*169*	308.71	1.51	4.58	0.805	*0.004*
PC2 +VE	1458.9(11)	*1647*	1196.42	0.27	2.01	0.935	*0.47*
PC3 -VE	1220.5(4)	*1150.5*	534.59	0.44	2.03	0.942	*0.667*
PC3 +VE	1824.87(8)	*1542*	1528.27	0.13	1.29	0.868	*0.144*
PC4 -VE	1275(1)	*1275*	-	-	-	1	*1*
PC4 +VE	2451(2)	*2541*	974.39	0	1	1	1
PC5 -VE	0	*0*					
PC5 +VE	7(2)	*7*	1.41	0	1	1	*1*
PC6 -VE	14(2)	*14*	9.89	0	1	1	*1*
PC6 +VE	310.5(2)	*310.5*	374.05	0	1	1	*1*
PC7 -VE	350(1)	*350*	-	-	-	1	1
PC7 +VE	457.14(7)	*146*	613.88	0.92	2.04	0.758	0.015
PC8 -VE	61(1)	*61*	-	-	-	1	1
PC8 +VE	2622(1)	*2622*	-	-	-	1	1
PC9 -VE	1127.33(3)	*1394*	853.82	-0.51	1.5	0.926	0.476
PC9 +VE	0	*0*					

*Table 10.29. Descriptive Statistics for Personal Context. Average duration of codes instance. *Significance of 0.001, reject sample data as being drawn from normal distribution.*

Code	Test statistic	Test statistic value	Mean Rank (Positive Sessions)	Mean Rank (Negative Sessions)	*(Df)*	*p*
PC0	-					
PC1	-					
PC2	t	3.673			*24*	**0.001***
PC3	-					
PC4	-					
PC5	-					
PC6	-					
PC7	-					
PC8	-					
PC9	-					
PC0	-					

*Table 10.30. Personal Context average duration of codes per instance. Test for differences in average duration of codes in positively rated sessions versus negatively rated. *Significance of 0.05.*

Average Duration Summed By Session.

Indexes	Mean	Med	SD	Skew	Kurtosis	Test for normality	
						Shapiro-Wilk W	*p*
PC0 -VE	226.5(2)	*226.5*	290.62	0	1	1	*1*
PC0 +VE	286(2)	*286*	192.33	0	1	1	*1*
PC1 -VE	319(2)	*319*	311.12	0	1	1	*1*
PC1 +VE	13(1)	*13*	-	-	-	1	*1*
PC2 -VE	703.67(6)	*443.5*	733.56	0.98	2.55	0.851	*0.162*
PC2 +VE	1816.44(9)	*1766*	1094.71	-0.12	2.4	0.938	*0.565*
PC3 -VE	1627.33(3)	*1764*	396.09	-0.55	1.5	0.91	*0.42*
PC3 +VE	2919.8(5)	*3540*	1234.83	-0.69	1.9	0.871	*0.272*
PC4 -VE	1275(1)	*1275*	-	-	-	1	*1*
PC4 +VE	2451(2)	*2451*	974.39	0	1	1	1
PC5 -VE	0	*0*					
PC5 +VE	7(2)	*7*	1.41	0	1	1	1
PC6 -VE	28(1)	*28*	-	-	-	1	*1*
PC6 +VE	621(1)	*621*	-	-	-	1	*1*
PC7 -VE	350(1)	*350*	-	-	-	1	*1*
PC7 +VE	1066.66(3)	*1373*	919.59	-0.54	1.5	0.916	*0.441*
PC8 -VE	61(1)	*61*	-	-	-	1	*1*
PC8 +VE	2622(1)	*2622*	-	-	-	1	***1***
PC9 -VE	1127.33(3)	*1394*	853.82	-0.51	1.5	0.926	*0.476*
PC9 +VE	0	*0*					

*Table 10.31. Descriptive Statistics for Personal Context. Average duration of codes when summed by session. *Significance of 0.001, reject data as being drawn from normal distribution.*

Code	Test statistic	Test statistic value	Mean Rank (Positive Sessions)	Mean Rank (Negative Sessions)	*(Df)*	*p*
PC0	-					
PC1	-					
PC2	t	2.172			*13*	**0.048***
PC3	-					
PC4	-					
PC5	-					
PC6	-					
PC7	-					
PC8	-					
PC9	-					

*Table 10.32. Personal context average duration of codes when summed by session Test for differences in average duration of codes in positively rated sessions versus negatively rated. *Significance of 0.05.*

Analysis into content running time

Indexes	Mean	Med	SD	Skew	Kurtosis	Test for normality	
						Shapiro-Wilk W	*p*
Negatively Rated	*39.57 (14)*	*30*	*27*	*0.31*	2.07	0.918	*0.121*
Positive Rated	*44.44 (18)*	*40*	*15.13*	*2.02*	6.71	0.711	***<0.001****

*Table 10.33. Descriptive statistics for content running time. Average programme length of selection. *Significance of 0.001, reject data as being drawn from normal distribution.*

Code	Test statistic	Test statistic value	Mean Rank (Positive Sessions)	Mean Rank (Negative Sessions)	*(Df)*	*p*
Content running time	U	79	*297*	*231*		0.074

*Table 10.34. Content running time. Test for differences in average durations positively rated sessions versus negatively rated. *Significance of 0.05.*

10.14 Appendix N: Study 2, part 2. Experience Episodes

Noted in this section are the descriptions of the Experience Episodes identified in Study 2, part 2. These were the consistent grouping of a number of experiential factors seen within viewing sessions, which were play out as very similar experiences by a number of users in the study. This suggests these grouping of factors are indicative of particular types of experience.

Experience Episode	**Enabling / Detracting Factors**	**Viewing Archetypes**	**Rating**
Focused Viewing	• No Verbalisation • Watched to end • Giving visual content full attention • Lowering light levels • Selecting HD content • Taking intervals	Quality Time Self Indulgence.	Positive

Table 10.35. Focused Viewing Experience Episode elements.

Focused viewing was observed occurring in people's homes. Typically it related to highly engaged viewing conducted on big screens in the living room. Mostly this viewing was shared, but individuals also created focused viewing. Users gave content full attention and even in shared environments talking was at a minimum. Extended session lengths were usual, as were actions such as lowering the lights or seeking out highly visual HD content. Many rich visual documentary programmes and favourite dramas were watched during focused viewing during the study.

Experience Episode	Enabling / Detracting Factors	Viewing Archetypes	Rating
Social Viewing	• Comment around content • Watched to end	Quality Time Sharing Space But Not Content.	Positive

Table 10.36. Social Viewing Experience Episode elements.

Social viewing was observed occurring in people's homes. Social viewing revolved around high social engagement and interaction with others actors in the environment. This often resulted in much distraction, and a reduction in focus on the video. Social viewing was conducting mainly in the early evening at the start of Quality Time. In many social viewing experiences the content is the focus of the comment, and this keeps people engaged with watching, even if just as a butt for jokes or the source of entertaining commentary. Despite the lack of engagement with the content users watch to the end and report having satisfying experiences.

Experience Episode	Enabling / Detracting Factors	Viewing Archetypes	Rating
Solitary Viewing	• No Verbalisation • Interruption and distraction • Using headphones • Pre-downloading content	Opportunist Planning Sharing Space But Not Content.	Positive

Table 10.37. Solitary Viewing Experience Episode elements.

Solitary viewing was observed occurring both in people's homes and out in public. The Experience Episode relates to users successfully managing to block out distraction around them in order to create positive viewing experiences.

These related strongly to creating personal private spaces and attempting to remain focused on content. Typically the experience was on mobile devices with the user using headphones outside the home, but the same experiences were seen in the home. Usually the setup was similar with the user using headphones and intent of remaining focused on the content. But this also afforded others in the home environment to utilise the main TV or other technology such as games consoles in close proximity. However these sessions had very little interaction or conversation and the focus was on the content.

Experience Episode	**Enabling / Detracting Factors**	**Viewing Archetypes**	**Rating**
Dissolving value 1 (Delays in reaching video)	• No Video • Dealing with errors • Delays in setting up • Sessions ended early	Quality Time Self Indulgence. Sharing Space but not content. Opportunist planning	Negative

Table 10.38. Dissolving Value 1 – Due to delays reaching video Experience Episode elements.

Dissolving Value 1 (due to delays in reaching video) happened in every Viewing Archetype. This Episode describes the issue of users losing interest in video because of initial difficulties in getting to watch. Typically these issues related to technical errors, connection problems and slow menus in some UIs. In these sessions the users incurred high cognitive load, a lot of navigation effort and significant delays in reaching video. Even if they did finally get to watch video, often the value of the experience appears to have been eroded and most users give up soon after.

Experience Episode	Enabling / Detracting Factors	Viewing Archetypes	Rating
Dissolving value 2 (interruption and distraction)	• Interruption and distraction • Sessions ended early	Quality Time Self Indulgence. Sharing Space but not content. Opportunist planning	Negative

Table 10.39. Dissolving Value 2 – Due to Interruption and distraction Experience Episode elements.

Dissolving Value 2 (interruption and distraction) happened in every Viewing Archetype. This Episode describes experiences being spoiled by interruptions and distractions. Outside the home these typically come from the environment. However in the home usually other family members create the distractions, although phone calls and other interruptions can have the same effect. As with dissolving value due to technical issues, these events appear to erode the value of continuing to watch. People feel their engagement with the content has been disturbed and they find if hard to refocus. Even if the distraction has finished, many users give up watching soon after.

Experience Episode	Enabling / Detracting Factors	Viewing Archetypes	Rating
Video as background 1 (off computer)	• Unrelated parallel tasks 1. (off computer) • Sessions ended early	Self Indulgence. Sharing Space but not content.	Negative

Table 10.40. Video as background 1 – off computer. Experience Episode elements.

Video as background 1 (off computer) happens in the home. This behaviour tends to happen when users are watching alone and relates to conducting other tasks around the home, which rob attention from watching. Examples included using other devices whilst watching and physical tasks such as cooking and cleaning. Users split their attention, and this often leads to them missing important information in the show. This is especially a problem if users are moving around the environment. Many users watching in this Episode don't report enjoyable experiences or watch to the end.

Experience Episode	**Enabling / Detracting Factors**	**Viewing Archetypes**	**Rating**
Video as background 2 (on computer)	• Unrelated parallel tasks 2. (on computer) • Sessions ended early	Self Indulgence. Sharing Space but not content.	Negative

Table 10.41. Video as background 2 – on computer. Experience Episode elements

Video as background 2 (on computer) happens in the home. This behaviour tends to happen when users are watching alone and relates to watching video on a computer whilst using it at the same time for other tasks. This was quite common and many users play video whilst working. However there focus is so strongly on the other tasks that they find it very difficult to follow any plot, and often have the video window hidden behind other task panes with just audio playing. As with viewing during other forms of multitasking, user don't report enjoyable experiences or watch to the end.